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NATURAL HISTORY SECRETARY.

"It will flourish, if naturalists, chemists, antiquaries, philologers, and men of science in different parts of *Asia*, will commit their observations to writing and send them to the Asiatic Society at Calcutta. It will languish, if such communications shall be long intermitted; and it will die away, if they shall entirely cease." SIR WM. JONES.

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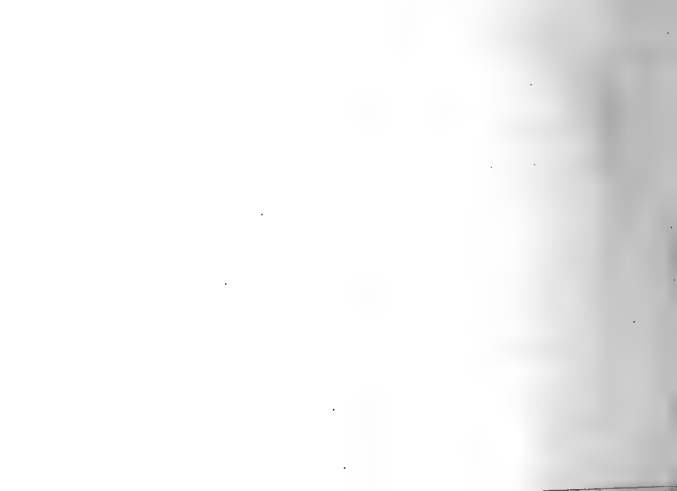
The map illustrating Captain Leonard Rogers' article, page 457, Part II, Vol. LXIX, 1900, is issued herewith, and should be bound up in its proper place. (*Ed.*)



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JOURNAL

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Vol. LXX. Part II.—NATURAL SCIENCE.

No. I.—1901.

I.—*Notes on the Fauna of Chitral.*—By CAPT. A. H. McMAHON, C.S.I.,
C.I.E., F.Z.S., *Political Agent, Dir, Swat, and Chitral.*

[Received 8th February ; Read 6th March, 1901.]

As in the case of “ Notes on the Fauna of the Gilgit District ” (*Journal*, Asiatic Society of Bengal, vol. lxviii, part 2, no. 2, pp. 105–109, 1899), I propose to place on record the results of such observations as I have been able to make in the matter of Zoology during my official connection during 1899–1900–1901 with the Chitral country.

I know of no previous records having been made of the Fauna of this country. Any record of the existence or non-existence of animals in it will therefore be of use in adding to general knowledge regarding the geographical distribution of the various forms of animal life.

As will be seen, my notes are lamentably scanty. They are based on personal observations made during three visits to Chitral, and on the information kindly given to me by Capt. B. E. M. Gurdon, C.I.E., D.S.O., Assistant Political Agent in Chitral, Major G. A. J. Leslie, R.E., and other military officers stationed in Chitral.

Such as they are, I place these notes on record in the hope that they may be of interest, and form the modest beginning of a more complete and comprehensive record.

The country of Chitral is similar in most respects to the adjacent Hindu Kush region of Gilgit. Geographically it may be defined as the

drainage area of the Chitral river and its numerous affluents as far south as the junction of the Arnawai river with the main stream.

Like Gilgit, it forms one of the most lofty tracts of country on the surface of our globe. From the high glacier-bound valleys which take their rise from Tirich Mir, 25,500 ft. and other lofty mountain peaks, the elevation of the country decreases until as one descends the valleys, the land of snow and glaciers is exchanged for barren hill sides, of rocky cliffs and debris. Passing through the fringe of forest line, one descends to the fertile alluvial plateaux of prehistoric river-beds through which the present streams now run in deep narrow gorges. The lowest elevation, *i.e.*, of about 4,000 ft., is reached at the point where the Chitral river leaves the Chitral district and thence onwards under the name of the Kunar river flows through Asmar to join the Cabul river.

The northern and eastern portions of Chitral are very similar in character to the Gilgit country, and the conditions of life being the same, the fauna is, as one would expect, much the same in both countries. Further south and west however the rainfall is greater, and the hill sides are consequently more covered with forest and vegetation than those of the Gilgit District.* This naturally tends to an increase in the number and variety of the fauna, and we find pheasants, monkeys, jungle fowl, and leopard (*Felis pardus*)† which are not to be found elsewhere in Chitral or Gilgit. I am told that the green parrot (I presume *Palæornis torquatus*) is to be found at the lower end of the Chitral valley. They doubtless come up from the warmer climes of the Jalalabad and Kunar valley.

The neighbouring country on the west, Kafiristan, is very thickly wooded, and from all accounts appears to be particularly rich in fauna of all kinds. Zoological research in Kafiristan would doubtless give most valuable and interesting results. It is to be regretted that such research is at present out of the question.

I proceed now to note on a few species of the Chitral Fauna.

MAMMALIA.—The most numerous of the larger mammals in Chitral are Ibex, Markhor and Oorial.

Ibex.—(*Capra sibirica*). These abound on or above the snow-line throughout the higher and more elevated portions of the Chitral country and in the upper portions of all the valleys which join the Chitral valley above Chitral itself. They are not as far as I know to be found in any valley below Chitral.

* Somewhat similar conditions with corresponding results as to fauna prevail in the Chilas tract on the S.-E. corner of the Gilgit District.

† As opposed to the snow leopard (*Felis uncia*).

They are identical with the ibex of the Gilgit District, but for some reason or other, the average length of the horns is slightly less than of those of the Gilgit ibex. Horns of over 40 inches in length are fewer than in Gilgit, and the largest head obtained is I think not over 45 inches.

The rutting season begins about the 1st of February and continues for upwards of a month, but in the case of the older males only half that time.

The young are born in July at an average elevation of 14,000 feet, generally, it is said, in the same nullahs as rutting took place. The females retire into very difficult and inaccessible ground before giving birth.

Markhor.—(*Capra falconeri*). These are very numerous in all the lower valleys in Chitral. They are of the Pir Panjal variety (*vide* fig. 165 of Blanford's Fauna of India. Vol. Mammalia), *i.e.*, with horns handsomely curved, but without the wide exaggerated curve and spread of the variety known as the Astor. [I may note here that the Astor variety is only to be found in the few valleys which join the Indus river on the left bank between Bunji and Chilas. All the markhor elsewhere in the Gilgit District are of the Pir Panjal variety].

A few heads somewhat resembling the Cabul variety (fig. 166 of Blanford's Fauna of India) are also to be found in Chitral.

The northern limits of markhor in Chitral appear to be:—in the Lutkho valley at a point half-way between Drusp and Shogot; in the Chitral main valley and valleys joining it on the left bank, at Mori (about 10 miles above Chitral). The southern limits of the Chitral (*i.e.*, Pir Panjal variety) are said to be:—on the right bank of the Kunar river at Chighar Serai, and on the left bank at Nari (Narsat).

The largest head as yet obtained in the Chitral District measures 56 inches in length of horn. Horns over 50 inches are very rare.

In Chitral the rutting season begins about the first week of December, and in Gilgit in about the second or third week of that month. It continues for about a month, but in the case of the older males only about a fortnight. The young in Chitral are born early in June, almost invariably, it is said, in the same nullahs where the parents were during the rutting season. The males leave these nullahs for cooler climes about May. The females retire into the highest and most difficult ground they can find in the nullah before giving birth.

Oorial.—(*Ovis vignei*).—These are plentiful in the Chitral valley from Reshan downwards. They are of the Ladak variety, known as shapu (*Ovis cycloceros*), and differ from the proper orial of the Punjab, Afghanistan, Sind and Beluchistan (*Ovis vignei*) in having no white ruff.

below the neck but only a white tuft in the black beard on the breast, and in having shorter but more massive horns. The horns seldom exceed 30 inches in length. Any over 32 inches are practically unknown. The horns however reach a circumference of from 10 to 12 inches round the base, whereas the oorial seldom exceeds 10 inches. In naming the Chitral animal oorial (*Ovis vignei*) as above I have followed the nomenclature of Dr. Blanford (Fauna of India) who includes both the shapu (*Ovis cycloceros*) and oorial (*Ovis vignei*) under that head. Their northern limits in Chitral are practically the same as those of the markhor.

Their rutting season begins about the 15th of November and continues about a month. The young are born at an average elevation of 9,000 feet.

Of large mammals the following are also common in Chitral.

Leopard.—(*Felis pardus*). This, the common Indian leopard, is numerous in the lower portions of the Chitral district. It is not to be found in Gilgit.

Snow Leopard.—(*Felis uncia*). Common in all the higher portions of the country.

Bears.—Unlike Gilgit, where the black bear (*Ursus torquatus*) is very rare, in Chitral it is very common, and abounds in the Chitral main valley and side valleys as far north as Reshan.

Brown bears (*Ursus arctus*) only occur in the Chitral country at the head of the Turikho and Yarkhun valleys. Its scarcity in Chitral is a contrast to its abundance in most parts of the Gilgit district.

Marmots.—The red or long-tailed Marmot (*Arctomys caudatus*) with its shrill whistle-like call, is to be found in large numbers at the head of the Ayun nullah, and at the head of the Yarkhun and Baroghil valleys. It does not appear to have been seen elsewhere.

[With reference to Marmots I might note here that since suggesting in my notes on the Fauna of Gilgit, that the Thibet, Himalayan, and Long-tailed Marmots (*Arctomys himalayanus*—*hodgsoni*, and *caudatus*), might prove to be all one and the same species, I have been informed by Dr. Blanford that the *A. himalayanus* and *A. caudatus* are distinctly different forms as shown by the structure of their skulls.]

Musk deer.—(*Moschus moschiferus*) is to be found in the Shisli Koh valley, and is said to be fairly common on the mountains dividing Chitral from Dir.

Monkeys are to be found in the lower end of the Chitral valley. They go about in herds.* I cannot say what species they belong to.

* Capt. Gurdon saw a herd of them at Mirkandi on the bank of the Chitral river only 4,000 ft. above sea-level.

The general characteristics seem to be those of *Macacus rhesus*, but all the specimens I have seen have, instead of a tapering tail, a tail of about 8 inches in length coming to an abrupt end as if it had been cut off like a fox terrier's. I am endeavouring to obtain a specimen to send down to the Indian Museum, Calcutta, for identification.

The existence of monkeys in Chitral, and also as will be noted elsewhere in Dir and Swat, is remarkable, as I do not know of their ever having been reported so far west.

Wolves, jackals, hyænas, lynxes, pig and foxes are to be found in Chitral as in Gilgit. As regards smaller mammals, I have been unable to make personal observations.

Reptilia and *Batrachia*.—As regards these I regret having been unable to make observations. As in Gilgit, these families are but sparsely represented. Snakes are few, and the only specimen I have been myself able to obtain was one of *Zamenis ventrimaculatus*.

Birds.—Owing to its larger extent of wooded tracts, birds, especially of the smaller kinds, appear even more plentiful in the winter months in Chitral than in Gilgit. I have been unable to study them, and will content myself with a brief note of such kinds as have come to my notice.

Tetraogallus himalayensis.—The Himalayan snow-cock known as the Ram Chickor is very plentiful on the higher slopes of all the Chitral valleys, as is the case also in Gilgit.

Chickor.—*Caccabis chucar* is also very common in the lower valleys. Hawking these birds with various kinds of hawks is the principal form of sport indulged in by Chitralis.

Note.—I have never heard of either the grey or black partridge, *Francolinus pondicerianus* or *vulgaris*, being found anywhere in Chitral.

Pheasants.—The Rohtas pheasant exists in the nullahs below Drosh, but I am unable to say whether it is the ordinary *Pucrasia macrolopha* or the species named *Pucrasia castanea* which "is only known" (*vide* Blanford's Fauna of India Birds, vol. iv.) "by two skins said to have come from Kafirstan. In these the neck all round, upper back, breast, "and flanks are chestnut, and the middle of the abdomen black." I am endeavouring to obtain specimens, in order to elucidate this point. The Monal pheasant, *Lophophorus refulgens*, is plentiful in the wooded valleys of lower Chitral.

No Kalij pheasants have as yet been met with in Chitral.

Jungle Fowl.—Capt. Gurdon informs me that he has often heard what he thinks must be jungle-fowl in the lower Chitral valleys. He says they crow just like a domestic cock. Unfortunately he has never obtained any specimens.

Mynas (the common *Acridotheres tristis*?) are very plentiful in lower Chitral. Eagles, Hawks and Vultures of various kinds are, as might be expected in such a mountainous country, very common in the winter months.

Chitral is famed for its Goshawks (*Astur palumbarius*) which are caught in large numbers every winter, or more correctly speaking at the commencement of each winter, as they pass over the country on their way to India. As many as 60 birds were caught in the winter of 1899. The method adopted is as follows; an open space of level ground, as high up a mountain side as possible, is selected. In the middle of this a hole large enough for a man to sit in is made, and then roofed over flush with the ground leaving a small concealed entrance at the side for entrance and exit. In the centre of the roof is a small hole through which a tame chickor is put out to walk about on the roof, attached by its leg to a string held by the man inside the chamber. The passing goshawk attracted by the chickor swoops down and seizes it, whereupon it is caught by the legs and pulled down by the man into the chamber below. These goshawks in travelling over Chitral fly very high, and in fine clear weather fly too high to be attracted by this method. It is in threatening, cloudy weather when they fly lower that captures are made. The females are by far the most valued, and all those caught are, by time-honoured custom, the property of the Mehtar, to whom they have to be presented. They are sometimes returned to the captor, but more frequently a suitable present is given in return. The Chitralis are famed for their skill in training hawks. A passage goshawk has been known to be flown with success at game within 5 days of its capture. A female goshawk flown at game, after a male bird has been released, will make straight for the male and kill it.

Pisces.—The fishes of Chitral have never been studied. The rivers contain fish in considerable numbers, though none reach any great size. A fish of 5 lbs. is said to have been caught in the lower Chitral river, but few reach 3 lbs. The majority appear to be of the kind known commonly as "Snow Trout," and is I presume a species of *Cyprinus*. A species of catfish (Siluroid) is also to be found in the lower waters of the Chitral River.

The Mahaseer, *Barbus tor*, is unknown in Chitral.

Lepidoptera.—The butterflies of Chitral include many rare and interesting kinds. Major G. A. Leslie, R.E., and Lt. W. H. Evans, R.E., are now engaged in making a collection which is likely to prove of great value.

I have recorded these notes with some diffidence. The zoological records of a country if they are to exist at all must have a beginning, even though that beginning be a modest one. Chitral offers an interesting field for zoological research, and it will be seen from the above notes how little has as yet been done in this direction.

The existence of monkeys, marmots, musk deer, shapu, Himalayan snow cock, and (I think we may add) jungle-fowl in Chitral is interesting, as no record appears to have been as yet made of these animals so far West.

II.—*Notes on the Fauna of Dir and Swat.*—By CAPTAIN A. H. McMAHON,
C.S.I., C.I.E., F.Z.S. *Political Agent, Dir, Swat and Chitral.*

[Received 8th February ; Read 6th March, 1901.]

On previous occasions I have, in the case of the Gilgit and Chitral Districts, placed on record a few notes on the Fauna of those countries, in the hope that though scanty in themselves they might be of interest in adding to our existing knowledge of the distribution of various forms of animal life.

I propose here to do the same with regard to the country of Dir and Swat, and to record such few observations on the Zoology of these countries as circumstances have allowed me to make during my stay (1899, 1900, 1901), in the Dir, Swat, and Chitral agency. Nothing as far as I know has ever been recorded in the matter of Zoology regarding these countries before. My notes therefore must be taken as a modest endeavour to make a commencement of the complete Zoological records which it is to be hoped will be made of these countries hereafter by more capable hands.

Inability to move freely about this unsettled country and press of work have prevented my observations being of anything like an extensive nature. The greater portion of the country is as yet unvisited by Europeans, and a wide field of interesting zoological research remains untouched.

The countries of Dir and Swat are treated here as one. They represent the drainage areas of the Panjkora and Swat rivers respectively as far as their junction. Both rivers take their rise within a short distance of each other in the lofty mountain range which forms the southern boundary of Chitral. The peaks of this range vary in height, decreasing from some 23,000 ft. on the N.-E. end to 15,000 ft. or so on the S.-W. end of the range.

The upper portions of the head valleys of both the Swat and Panjkora rivers resemble in most respects the valleys which on the north side of the range form part of Chitral. It is to be expected therefore that their fauna much resemble that of corresponding tracts in Chitral.

The remainder and the greater part of the Dir and Swat countries are at a much lower elevation than that of Chitral. Both are mountainous, but each successive mountain range, as one proceeds southwards, becomes lower and lower, until at the southern edge of the country the highest peaks attain to no more than 6,000 ft., while the main valleys gradually descend to an elevation of only some 2,000 ft. Both the upper and lower portions of the Dir and Swat countries differ in one respect from Chitral, in that the annual rainfall is very much greater. This has resulted in clothing the hill sides of the upper valleys with wide deodar forests, and in thickly covering the lower slopes with pine, oak and other small trees. The lower valleys are wide expanses of alluvial land of great fertility.

As might be expected, the fauna of the country is very rich and varied. How little we yet know of it will be seen by the scantiness of these notes.

Mammalia.—On the northern fringe of Swat where the watershed of the Swat river is also the watershed of some of the upper Chitral valleys, the ibex (*Capra sibirica*) is reported. These I think are only visitors from the Chitral side. Ibex is not found in Upper Dir.

Markhor.—(*Capra falconeri*). A few of the Pir Punjab variety with gracefully curved horns (Fig. 165 of Blanford's Fauna of India, Vol. Mammalia) are to be found on the range which separates Dir from Chitral, and Asmar. I do not know if any exist in Upper Swat or Swat Kohistan, but one might expect to find them there.

Further south in the range of hills which separate Swat from Boner and the Peshawar plain, the Cabul variety with almost straight horns and a slight spiral are found.

Orials.—*Ovis vignei* exist but in small numbers in the Southern borders of Swat. They are of the Punjab variety, *Ovis vignei* proper, and I have not heard of the existence in Dir and Swat of the *Ovis cycloceros* or Shapu variety. It is doubtless to be found however in Swat Kohistan which lies between Chitral and Chilas both possessing this variety.

Goral.—*Cervus goral* has been seen in the Lower Swat valley, where one was caught alive while being swept down the Swat river in a flood, and also on the hills above Malakand. The existence of this

animal is interesting, as it does not appear ever to have been before reported west of the Indus.

Musk Deer.—*Moschus moschiferus* is reported to be numerous in the upper portions of Dir.

Bears.—The Brown Bear, *Ursus arctus*, has never been reported in Dir or Swat.

The Black bear, *Ursus torquatus*, is very common all over Dir and Swat, even as far south as the range separating Swat from the Peshawar valley.

Leopards.—The existence of snow leopard (*Felis uncia*) has never been reported, but I feel sure it is to be found in Swat Kohistan. The common leopard, *Felis pardus*, is very plentiful throughout Dir and Swat.

Monkeys.—It is somewhat surprising to find that monkeys are fairly common throughout most parts of Dir and Swat. I have seen several live specimens that have been brought in from Dir, and a large herd of monkeys has been lately seen on the slopes of the Bar Chanrai hill on the north side of the Lower Swat valley opposite Malakand. I have been unable to satisfy myself about the identity of this monkey. It appears to be of the same kind as specimens which I have seen in Chitral. I have only seen live specimens of animals of both countries. These strongly resented the close examination which is necessary for identification. In general characteristics they would appear to resemble either *Macacus rhesus* or *Macacus assamensis*, but their tails, which in adults are about 8 inches in length, are not tapering but come to an abrupt end as though cut off, like a fox terrier's tail. I hope to be able to send a specimen of this monkey to the Indian Museum, Calcutta, for classification.

I should note that the existence of monkeys has been also reported to me as having been met by officers while out after markhor in the Pajja hill north of Mardan.

Among other common mammals in Lower Dir and Swat are the hyæna, jackal, fox, wolf, pig, hare, porcupine (*Hystrix leucura*) and hedgehog.

Reptilia or *Batrachia*.—Regarding these my observations have been confined to the immediate neighbourhood of Malakand and the Lower Swat valley between Chakdara and Malakand. Both snakes and lizards are numerous in the above area, but I have devoted my attention chiefly to the former, of which I have examined a large number of specimens.

Ophidia.—Though snakes are numerous, they seem all to belong to but very few species. By far the commonest genus of snake in this

tract appears to be the *Zamenis* which is therein represented by the following species.

Zamenis diadema.—This is very common, and the specimens obtained average between 5 to 6 ft. in length. One specimen killed had just swallowed a large rat. The peculiarity about most specimens is the bright red colour of their heads. I have noticed this elsewhere on the N.-W. frontier.

Zamenis mucosus.—Also common. Several very large specimens were sent me from Mardan. This snake, both in Mardan and here, is very dark coloured, and curiously resembles the black form of cobra. I have been more than once taken in by this resemblance. It is very common in the Guides' grass farm at Mardan, where it is the terror of the grass cutters. It adds to its similarity to a cobra by inflating out its neck into some resemblance to a cobra's hood—and assuming a most threatening aspect.

Zamenis ladacensis.—Very common. I also obtained specimens of this snake with a bright vermilion line down the centre of its back. I understand that this variety used to be considered a separate one under the name *Zamenis rhodorachis*. This peculiar and very conspicuous colouring would almost appear to entitle it to retain a separate name.

Zamenis ventrimaculatus.—Not so common as the preceding species.

Next to the *Zamenis* comes in point of numbers of specimens obtained, the *Echis carinatus*, which is plentiful everywhere. It is possible that it is in reality far more numerous than the *Zamenis*, but escapes detection by its protective colouring and smaller size. This is the only species of the *Viperidae* that has come to my notice in this country.

Naja tripudians.—I have only obtained a few specimens of the cobra in this country. It does not appear to be numerous. Those obtained have all been of the black variety.

Bungarus cæruleus.—Only one specimen of the karait obtained, and that in Malakand itself.

Tropidonotus piscator.—Common in the Swat valley; one large specimen was found to have 18 large developed eggs inside it.

Tropidonatus stolatus.—One specimen.

I have subsequently obtained another specimen, which I sent alive to the Indian Museum, where I called Major Alcock's attention to its colouring. The vivid light yellow colour of the centre portion of each cross band down the length of its back has not been brought to notice before.

Lycodon striatus.—One specimen which I sent to the Indian Museum, Calcutta, where it was identified by Major Alcock.

Gongylophis conicus.—I obtained several specimens of this curious snake.

Contia angusticeps.—This snake deserves some remark. I obtained eleven specimens of it at Malakand and was unable to identify it. Major Alcock, Superintendent, Indian Museum, Calcutta, to whom I sent specimens, was also unable to identify it with any known species, and it was sent to the British Natural History Museum, where Mr. Boulenger has identified it as the above, i.e., *Contia angusticeps*, of which only one specimen appears to have been previously found.

Ophidia.—Continued.

Oligodon subgriseus.—One specimen.

Typhlops braminus.—Two specimens, which I sent alive to the Indian Museum, Calcutta.

Glauconia blanfordii.—I obtained one specimen, which I sent alive to the Indian Museum, Calcutta. It unfortunately escaped before being definitely identified. Major Alcock says he thinks it was the above species.

Lacertilia.—Notwithstanding the number of Lizards in the country, I regret having been unable to devote attention to them. The only specimens examined by me, have been as follows;—

Varanus flavescens.—This is very common and attains a length of about 3 feet.

Varanus bengalensis.—Common.

Gymnodactylus scaber. One specimen identified as above by Major Alcock.

Calotes versicolor.

Eublepharis macularius.—One specimen identified by Major Alcock. The colouring of this specimen in life deserves notice. The transverse bands were jet black and bright yellow with a faint subshade of pink.

BIRDS.—The Dir and Swat countries are rich in varied and numerous kinds of birds, both visitors and permanent residents. A careful study of them would doubtless prove of great interest. Among the few specimens examined by me are the following.

Rallus aquaticus ♀.—Water Rail. Differs from the type given in Fauna of India (Birds, Vol. IV), in having the ashy-grey of the breast slightly (though very slightly) washed with brown. Its length is 12 inches, instead of 11 inches as in the type.

Otis tetrax.—Little Bustard. Two specimens obtained in winter between Malakand and Mardan.

Cygnus olor.—Mute Swan. One live but wounded specimen brought in March, 1900, by a man who said he had shot it with three others at the mouth of the Swat river at Abazai.

Lophophorus refulgens.—The Monal Pheasant is fairly common in the higher and wooded slopes of all the Dir and Swat valleys. It appears to suffer from snow blindness, and is easily caught at such times. Several live specimens have been brought to me from Dir, and one from near Thana in Lower Swat.

Circus cyaneus.—Hen Harrier. One specimen obtained from the edge of the Peshawar plain, November, 1900.

Duck and teal of many kinds pass through Swat and Dir on their way to and from India in the autumn and spring. Quail and snipe also pass through. I have never heard of Sand Grouse having been seen.

The Chickor and Scarse are permanent residents and very common. So also are the Grey and Black Partridges. The Black Partridge only frequent the lower ends of the valleys. The Grey extend further up the valleys.

Pisces.—The Panjkora and Swat rivers are full of fish, chiefly of the kind commonly known as Snow Trout, which would appear to be a species of *Cyprininae*.

Mahaseer (*Barbus tor*) ascend both rivers in considerable numbers in the spring, but very few remain during the winter, as they nearly all descend again to the Cabul river in the late autumn. Mahaseer up to 30 lbs. have been obtained in the lower reaches of the Panjkora and Swat rivers.

III.—*Note on the Butterflies comprised in the subgenus Tronga of the genus Euplœa*.—By LIONEL DE NICÉVILLE, F.E.S., C.M.Z.S., &c.

[Received March 15th; Read April 3rd, 1901.]

In the Proceedings of the Asiatic Society of Bengal, 1892, pp. 158-161, will be found a note by me on the Indian and Malayan Peninsula Butterflies of the subgenus *Stictoplœa* of the genus *Euplœa*. In the Trans. Ent. Soc. Lond., 1892, pp. 247-248, is practically a *resumé* of this paper. In the Journal of the Asiatic Society of Bengal, vol. lxi, pt. 2, pp. 237-245 (1892), I gave a note on the subgenus *Pademna* of the genus *Euplœa*. In the present paper I propose to deal with the subgenus *Tronga* of the genus *Euplœa*. I am driven to do so by the circumstance that Mr. Robert Shelford, Curator of the Sarawak Museum, Borneo, has from time to time sent me large numbers of *Trongas*, imploring me to name them for him, as he is unable to do so from Dr. F. Moore's paper on the *Euplœina* in the Proceedings of the Zoological Society of London for 1883, pp. 253-324, in which six

species of the subgenus from Borneo are given as distinct, and from the other literature at his disposal. I was no more successful than Mr. Shelford, and as in Calcutta I am shut off from access to the type specimens of all the described species, I despatched twenty-two male *Trongas* from Sarawak to Dr. Moore, who has been so kind as to set them all, and to return them to me. Under the date 7th October, 1900, he writes to me:—"I have compared your twenty-two male *Trongas* with the types available, and have put the name to a specimen agreeing exactly with the types of *T. crameri*, Lucas, *T. brookei*, Moore, and *T. labuana*, Moore. I have also enclosed a pencil sketch of the types of *T. moorei*, Butler, and *T. pryeri*, Moore, to which none of yours agree. The types of all these are now in the British Museum. The other unlabelled specimens of *Tronga* returned you will easily be able to match with the verified specimens. I have not been able to examine them with *T. daatensis*, Moore, as I have no opportunity now of comparing them with the type. I hope these will enable you to satisfy yourself as to their specific value or otherwise." I would have been still more grateful to Dr. Moore for his kindness than I am had he been so good as to have given me his opinion as to the names by which the nineteen specimens he returned unnamed should be known. In this and similar cases it is not difficult to pick out and name extreme individual forms of a variable species, but it is the intermediate specimens that puzzle one. However, with three named species, drawings of two others, and the description of the sixth it is not difficult to deal with the species of *Tronga* found on the northern side of Borneo. I may note that the Island of Daat, from whence *T. daatensis* was described, is quite close to the much larger island of Labuan on the North-West coast of Borneo; both these islands lie very near to the coast, and are therefore not likely to possess any species peculiar to them, especially *Euplœas*, which are well known to have very tough constitutions and to take long and voluntary journeys. On this subject Mr. W. P. Pryer in Ann. and Mag. of Nat. Hist., fifth series, vol. xix, p. 48, n. 16 (1887) has some very interesting notes on the migrations of *Euplœas* in North Borneo.

Dr. Moore in Proc. Zool. Soc. Lond., 1883, gives twelve species of *Tronga*, from the Nicobar Isles, Lower Burma, the Malay Peninsula, Sumatra, Nias, Borneo, and China. The latter habitat is most vague, as China is a vast country. In "Lepidoptera Indica," vol. i, pp. 76-80 (1890), Dr. Moore retains twelve species in the genus, out of which he describes as new *T. nicevillei* from the Sunderbunds near Calcutta, and *T. heylertsii* from Sumatra, but he sinks his *T. olivacea*, Moore, as a synonym of *T. bremeri*, Felder, and omits all reference to *T. kinbergi*,

Wallengren, from China, the total number therefore remaining the same as in 1883.

In 1896, Mr. H. Fruhstorfer recorded *E. (Tronga) kinbergi*, Wallengren, from the Tengger mountains, 2,000 feet, East Java. In 1898, Mr. Fruhstorfer described *Tronga crameri tenggerensis*, new subspecies, from the same place.

In 1896, Dr. B. Hagen described and figured an *Euplœa pagenstecheri* from Bawean Island, which lies midway between Borneo and Java. The describer says it comes into Moore's genus *Menama*, which has in the male an androconal patch of shining black scales on the upperside of the hindwing behind the subcostal nervure towards the base of the wing (not mentioned by Dr. Moore), this character being absent from the genus *Tronga*. Dr. Hagen says it is allied to *E. lorzæ*, Boisduval (a MS. name only, the species should be credited to Dr. Moore, who first described it). Mr. Fruhstorfer, however, makes it a local race of *Tronga crameri*, Lucas. From the figure I should say that it is a *Menama* rather than a *Tronga*, but it is impossible to be certain without seeing a male specimen.

In 1898, Dr. Hagen described *Euplœa (Tronga) mentawica* and *E. (T.) morrisi*, from the Mentawej Islands, which lie to the south of the centre of the island of Sumatra.

In 1898, Mr. F. Fruhstorfer gave a list of the butterflies of the genus *Tronga*, and described *Tronga crameri tenggerensis* from the Tengger mountains, East Java, 2,000 feet, and *Tronga crameri*, ab. *biseriata*, from East Java. It is not known to me if Mr. Fruhstorfer considered in 1898 that his *E. tenggerensis* is the same species as the *E. kinbergi*, Wallengren, he recorded in 1896 from the same spot. As noted above, the latter was originally described from China. But he remarks that the specimen in question appears to him to be a form of the very variable female of *Euplœa (Isamia) rafflesi*, Moore, described from Java. He goes on to say that "In the British Museum *E. kinbergi* is apparently by mistake labelled as coming from China," although it was originally described from thence. In the same paper Mr. Fruhstorfer notes that *Euplœa (Tronga) brookei*, Moore, from Borneo is identical with *Euplœa (Menama) lorzæ*, Moore, also from Borneo. This is wholly wrong, the two species are absolutely distinct, and Dr. Moore has correctly placed them in his genera *Tronga* and *Menama* respectively, although he has omitted to describe the satiny shining black patch of androconia on the upperside of the hindwing of the male by which *Menama* can in that sex be at once distinguished from males of *Tronga*, which lack this patch. Mr. Fruhstorfer further notes that it is impossible to establish the genus *Menama* [as distinct from *Tronga*],

inasmuch as in Borneo as well as in Sumatra there are "double" forms of *Tronga* and *Menama*. He says that he possesses, for example, specimens of *Tronga niasica*, Moore, from Nias Island with rounded forewings and others with angled forewings. That is quite probable, most likely in addition to *Tronga niasica* there is an undescribed species of *Menama* from that island, which I have not seen, though I have many males of *T. niasica*. Mr. Fruhstorfer also notes that the *E. (Tronga) crameri* of Lucas which I recorded from Bali seems to belong to *E. crameri tenggerensis*, Fruhstorfer. This is not absolutely the case, as my single specimen from that island does not agree entirely with Mr. Fruhstorfer's new subspecies, as it has fewer and smaller spots on the forewing, so is not typical, and is certainly in my opinion not a species distinct from *E. crameri*. In the genus *Euploea* I do not consider as a rule an extra spot or two, or even a whole series of spots, of any specific value whatever; the maculation in *Euploea* is in nearly every species a most variable character. Lastly Mr. Fruhstorfer notes that it is curious that no species of *Tronga* has been found in the island of Palawan in the Philippines, but that in the other parts of the Malayan region there are two distinctly marked species of *Tronga* which may be classified according to the following scheme:—

A. Hindwing with a prominent row of submarginal dots:—under which he places (1) *T. crameri*, Lucas, (2) *T. crameri brookei*, Moore, (3) *T. crameri marsdeni*, Moore, (4) *T. crameri bremeri*, Felder, (5) *T. crameri moorei*, Butler [incorrect, as this is a *Menama*, not a *Tronga*], (6) *T. crameri pagenstecheri*, Hagen, (7) *T. crameri tenggerensis*, Fruhstorfer, and ab. *biseriata*, Fruhstorfer, (8) *T. crameri biseriata*, Moore, and (9) *T. crameri morrissi*, Hagen. He notes that *T. daatensis*, Moore, *T. tabuana*, Moore, *T. johanna*, Kirby, and *T. olivacea*, Moore, all fall to *T. crameri*, Lucas. As regards *T. olivacea* this is incorrect from even Mr. Fruhstorfer's views of the genus *Tronga*, as that species is, according to Dr. Moore himself, based on a small female variety of *T. bremeri*, Felder.

B. Hindwing with a double series of very large clear white spots:—under which he places (1) *T. pryeri*, Moore, (2) *T. pryeri heylertsii*, Moore, (3) *T. pryeri niasica*, Moore, (4) *T. pryeri mentawica*, Hagen, and (5) *T. pryeri nicevillei*, Moore. Of *T. crameri brookei*, Moore, he notes that it is perhaps a dry-season form of *T. crameri*, Lucas; while of *T. pryeri heylertsii*, Moore, he notes that it is apparently a rainy-season form. These surmises are I think quite incorrect, as in Borneo, Sumatra, and the Malay Peninsula, where these species are said to occur, very few butterflies indeed exhibit seasonal changes, there being no well-marked wet- and dry-seasons, rain falling almost throughout the year, and

certainly no such seasonal forms are found in the genus *Euplœa* occurring in those regions.

I have long held the opinion, gained by an extensive knowledge of the genus *Euplœa* in life, that in nearly all cases it is highly improbable that any one spot will contain two really distinct species of one group of the genus. Dr. Moore in his most valuable monograph of the genus *Euplœa* written in 1883 evidently had no such suspicion, never having seen a live *Euplœa*, nor an opportunity of examining hundreds of specimens from a single locality as I have frequently done, as, for instance, he gave six (one with a query) species of *Tronga* from Borneo; six of *Pademna* from Assam, and probably several others, as he records four other species from E. and N.-E. Bengal, and another with a query, which probably mean Assam; four of *Isamia* from South China and three from Cochin China; and four of *Stictopœa* from Assam. While working up the Bornean *Trongas*, I thought it would be well to verify as far as I could this general opinion of mine that it is exceptional for two distinct species of one group to really occur in any one given locality, and taking up only India and those regions lying adjacent thereto and Southern China, regions that I am more or less well acquainted with from visiting many of them for the purpose of collecting butterflies, I find on the whole that my conjectures are likely to prove correct, though in two or three groups, subgenera or genera (it is immaterial for our purpose how we term them, though I prefer subgenera in our present ignorance of the transformations of most of the species), this is certainly not the case, as in *Penœa* we have a brilliantly blue-glossed species (*deione*, Westwood) and a non-blue-glossed species (*doubledayi*, Felder) occurring together in Sikkim, Assam and Burma; while two quite distinct non-glossed species, differing entirely in size and male sexual brands, *gardineri*, Fruhstorfer, and *menetriesii*, Felder (= *pinwilli*, Butler and *evalida*, Swinhoe) occur together in the Malayan Peninsula and Sumatra; again in *Pademna* we have in the region of Calcutta and southwards to Travancore a species (*kollari*, Felder) which is but slightly if at all blue-glossed in those regions, gradually merging in other parts of Bengal (the Maldah district for instance), Sikkim, Bhutan and Assam into a strongly blue-glossed species (*klugii*, Moore). It is difficult to know how to deal in systematic work with such forms, as the one is quite distinct and constant in one region, while in another region this erstwhile "good species" becomes gradually merged into another species which in its extremest form is absolutely different. In Hongkong also two apparently quite distinct species of *Crastia* occur, viz., *godartii*, Lucas, and *kinbergi*, Wallengren. However, these exceptional groups do not greatly invalidate my previous conceptions of these various subgenera

of *Euplœa*, as speaking generally I think it may be treated as an axiom that no two really distinct species of one subgenus will be found to inhabit one limited area. If would-be describers of *Euplœas* and several other genera would bear this in mind in future, we would be saved many of the synonyms of the past which burden our butterfly literature and give endless trouble in trying to unravel them. I may note here that I wholly dissent from the opinions held by Colonel C. Swinhoe as expressed in Trans. Ent. Soc. Lond., 1893, p. 270, that varietal forms of well-known species should be named. It may be arguable that "varieties" may perhaps be described and named for the sake of convenience, though I consider it to be very inexpedient to do so, especially in certain groups of *Euplœas* in which it is almost impossible to find two specimens marked exactly alike, and to be logical every specimen should have a name and thus reduce scientific nomenclature to an absurdity; but what I especially deprecate is calling these obvious varieties "new species," which they certainly are not. However, the late Capt. E. Y. Watson in Journ. Bomb. Nat. Hist. Soc., vol. x, pp. 639-640 (1897) has already very clearly pointed out the untenable position taken up by Col. Swinhoe in this matter, so I will not further attempt to "kill the slain."

To prove my thesis I will give some lists of subgenera of *Euplœa* which I think will help to substantiate my case. These lists are not exhaustive and may perhaps contain some slight inaccuracies, but they are I believe in the main correct, and may prove perhaps to be some help to others in working at this great group. The names placed in brackets are in my opinion synonyms. The order of subgenera is that followed in Dr. Moore's monograph of the *Euplœina* published in 1883. It would have been better to have given two lists, one of localities the other of species, but this would have taken up too much time and space, so I have adopted the second course; the first can with a little trouble be evolved from it.

MENAMA, Moore.

Lower Burma, *modesta*, Butler (*cupreipennis*, Moore, *tavoyana*, Malay Peninsula, *modesta*, Butler. [Moore]).

Siam, *camaralzeman*, Butler.

„ *modesta*, Butler.

Nicobar Isles, *simulatrix*, Wood-Mason and de Nicéville.

Sumatra, *moorei*, Butler.

„ *buxtoni*, Moore.

Borneo, *lorzæ*, Moore.

Menama does not apparently support my theory, as from the list above two species are given from Siam; but Siam is a large country and may have two distinct species of *Menama* occurring in different parts of it, though as *camaralzeman* and *modesta* apparently differ not at all except in size—this difference being very considerable—it may be that they are one and the same species. Again two species, *moorei* and *buxtoni*, are recorded from Sumatra, the former is non-blue-glossed, the latter is blue-glossed. I have had very numerous specimens of *moorei* from thence, it is very common there, but I have never seen *buxtoni*, so there may be some mistake about the habitat of that species. Dr. Moore places *moorei* in *Tronga*, but it is a true *Menama*.

TRONGA, Moore.

Lower Burma, *crameri*, Lucas (*bremeri*, Felder, *johanna*, Kirby, *marsdeni*, Moore, *olivacea*, Moore, *brookei*, Moore, *labuana*, Moore, *daatensis*, Moore, *pryeri*, Moore, *heylærtsii*, Moore).

Malay Peninsula, *crameri*, Lucas.

Nicobar Isles, *frauenfeldii*, Felder (*esper*, Felder, *biseriata*, Moore).

Sumatra, *crameri*, Lucas.

Banka, *crameri*, Lucas.

Bali, *crameri*, Lucas.

Borneo, *crameri*, Lucas.

Natuna Isles, *crameri*, Lucas.

Java, *tenggerensis*, Fruhstorfer, and ab. *biseriata*, Fruhstorfer.

Nias Island, *niasica*, Moore.

Bawean Island, *pagenstecheri*, Hagen.

Mentawej Isles, *morrisi*, Hagen.

„ „ *mentawica*, Hagen.

The subgenus *Tronga* is more fully considered on pages 30-38. I need only note here that I have not seen the two species recorded from the Mentawej Isles described as distinct by Dr. Hagen. It is highly probable I think that they are synonymous, and moreover are not separable from some previously-described species.

ADIGAMA, Moore.

Malay Peninsula, *malayica*, Butler (*stolli*, Weymer).

Sumatra, *malayica*, Butler.

Nias Island, *malayica*, Butler.

Java, *ochsenheimeri*, Moore.

Borneo, *scudderii*, Butler.

Palawan (Philippines), *claudina*, Staudinger.

I have nothing to remark about this subgenus; each of the four known species inhabits a distinct area, and no two of them have been recorded from the same area.

PENOA, Moore.

Eastern Himalayas, *doubledayi*, Felder.

„ „ *deione*, Westwood (*poeyi*, Felder, *magnifica*,
Assam, *doubledayi*, Felder. [Butler).

„ *deione*, Westwood.

Upper Burma, *doubledayi*, Felder.

„ „ *deione*, Westwood.

Lower Burma, *doubledayi*, Felder.

„ „ *gardineri*, Fruhstorfer.

„ „ *limborgii*, Moore.

Malay Peninsula, *gardineri*, Fruhstorfer.

„ „ *menetriesii*, Felder (*pinwilli*, Butler, *valida*,
Indo-China, *limborgii*, Moore. [Swinhoe).

„ *gardineri*, Fruhstorfer.

Sumatra, *menetriesii*, Felder.

„ *gardineri*, Fruhstorfer.

Nias Island, *menetriesii*, Felder.

„ „ *kheili*, Weymer.

„ „ ? *uniformis*, Moore.

Banka, *menetriesii*, Felder.

Java, *alcatheë*, Godart (*melancholica*, Butler).

„ *wallengrenii*, Felder.

„ ? *geyeri*, Felder.

„ ? *eyndhovii*, Felder.

Billiton, *transpectus*, Moore.*

Lombok, ? *geyeri*, Felder.

„ *sapitana*, Fruhstorfer.

Borneo, *uniformis*, Moore.

„ *zonata*, Druce.

„ *masina*, Fruhstorfer.

Mentawej Isles, *seitzi*, Hagen.

Palawan (Philippines), *cyllene*, Staudinger.

„ „ *distincta*, Staudinger.

I have made some remarks on the subgenus *Penoa* on page 16. It is

* Mynheer P. C. T. Snellen in Tijd. voor Ent., vol. xxxiii, p. 284, n. 4 (1890), records *E. alcatheë* from Billiton. It is unknown to me whether or no he considers *P. transpectus* to be a synonym of that species.

an exception to my theory that two allied species of the same subgenus do not as a rule occur in the same region. The synonymy of the subgenus has been greatly changed since Dr. Moore's Monograph of the *Euplaeina* was published in 1883, and since his "*Lepidoptera Indica*" appeared. In the first-named paper his No. 1, *alcathoë*, Godart, is the *doubledayi* of Felder; his No. 3, *menetriesii*, Felder, is the *gardineri* of Fruhstorfer; and his No. 4, *pinwillii*, Butler, is the *menetriesii* of Felder. I think the number of recorded species in this genus will be greatly reduced in the future, and many of the names given above as representing distinct species will be reduced to the rank of synonyms. I possess only *doubledayi*, *deione*, *gardineri*, *limborgii*, *menetriesii*, *alcathoë*, *? geyeri*, *uniformis*, and *zonata*.

CRASTIA, Hübner.

- | | | |
|--|---|---|
| Western Himalayas | } | <i>core</i> , Cramer. (<i>cora</i> , Hübner, <i>vermiculata</i> ,
Butler, <i>nicevillei</i> , Moore). |
| Eastern „ | | |
| Continental India | | |
| Peninsular „ | | |
| Ceylon, <i>asela</i> , Moore. | | |
| Burma (Upper only) | | <i>core</i> , Cramer. |
| Burma, <i>godartii</i> , Lucas (<i>siamensis</i> , Felder, <i>layardi</i> , Druce, <i>subdita</i> , | | |
| Malay Peninsula, <i>graminifera</i> , Moore. | | [Moore, <i>binghami</i> , Moore). |
| „ „ <i>? godartii</i> , Lucas. | | |
| „ „ <i>distantii</i> , Moore. | | |
| Indo-China, <i>godartii</i> , Lucas. | | |
| „ „ <i>mouhotii</i> , Moore. | | |
| „ „ <i>? amymone</i> , Godart. | | |
| China, <i>kinbergi</i> , Wallengren. | | |
| „ <i>lorquintii</i> , Felder (<i>felderi</i> , Butler). | | |
| „ <i>? amymone</i> , Godart. | | |
| „ <i>godartii</i> , Lucas. | | |
| „ <i>prunosa</i> , Moore. | | |
| Nicobar Isles, <i>scherzeri</i> , Felder (<i>camorta</i> , Moore). | | |
| Sumatra, <i>? amymone</i> , Godart. | | |
| „ <i>inconspicua</i> , Moore. | | |
| „ <i>distantii</i> , Moore. | | |
| „ <i>felderi</i> , Butler. | | |
| Engano Isle, <i>enganensis</i> , Doherty. | | |
| „ „ <i>oceanis</i> , Doherty. | | |
| Java, <i>haworthii</i> , Lucas (<i>eleusina</i> , Hübner, part, pl. ccxxii (ix),
figs. 1, 2, <i>nec</i> Cramer, <i>hübneri</i> , Moore,
<i>moorei</i> , Felder, <i>janus</i> , Butler). | | |

Java, *godartii*, Lucas.

Philippines, *snelleni*, Moore.

„ *godartii*, Lucas.

From the list above it would appear that *Crastia* does not bear out my theory at all. Under *core* I have placed *cora*, Hübner, and *vermiculata*, Butler, as these names represent the dry-season form of the species. I have also added *nicevillei*, Moore, which comes from the Sunderbans, near Calcutta. Many years ago four specimens of the “species” were given to me, taken in February, and I set them down to be rather unusually white examples of the dry-season form of *core* (*cora*+*vermiculata*). Two of these I gave to Colonel Swinhoe, and Dr. Moore described them as *Tronga nicevillei* in Lep. Ind., vol. i, p. 77, pl. xx. The male has no sexual brand in the submedian interspace of the forewing, this brand, however, is often obsolete in *C. core*, and is not a character of much importance. The wings also are broader than in typical *C. core*. In spite of these obvious differences, I am still of opinion that *Tronga nicevillei* is nothing more than the dry-season form of *Crastia core* found in the swamps of the Sunderbans. I cannot believe that an absolutely distinct species of *Euploea* is alone to be found in a very limited area of recently formed alluvial land attached to the mainland of Bengal. Except for this “species” India proper and Ceylon is each inhabited by only a single species of *Crastia*.

We now come to Burma, where *godartii*, Lucas, of which *siamensis*, Felder, is an undoubted synonym, is the dominant form. With it is found *layardi*, Druce, of which *binghami*, Moore, is a pure synonym. In this form the pale violet apical area to the forewing on the upperside in both sexes is absent; but this feature is not constant, and intergrades between true *godartii* and true *layardi* are occasionally found. But in the extreme north of Burma on the coast at Akyab, at Rangoon, and in Upper Tenasserim in Central Burma at Hatsiega is found *subdita*, Moore, which is the type and only species of Moore's genus *Mahintha*. The only specimens of this form that I have seen are from Akyab and the Arakan Hills, the latter locality being rather uncertain, as my specimens did not reach me direct from the collector but through a third person. These examples do not quite agree with Dr. Moore's figures of *subdita* from Akyab, (Lep. Ind., vol. i, pl. xxix), being less broad in the wing. As a species I do not consider it to be distinct from *layardi*, which again equals *godartii*, although its wings are a little broader than typical specimens of the last-named species. It bears the same relation to *godartii* that *nicevillei* does to *core*. In Upper Burma (Akyab, the Arracan Coast, and at Rungamutti in the Chittagong district) *E. core* has been obtained singly.

In the Malay Peninsula, *distantii*, Moore, was described from a single specimen from Province Wellesley (in Sumatra it is the common and dominant *Crastia*), but *godartii* has been recorded by Mr. Distant from Singapore, probably erroneously, and Dr. Moore has described *Crastia graminifera* from the "Malay Peninsula" apparently from a unique male example in Mr. Oberthür's collection. He compares it with *vermiculata*, Butler, but from the description it would appear to be nothing but a form of *C. distantii*, Moore, with rather smaller spots than in the typical specimens of that species; an obviously variably character in my large series of that species. Mr. Distant in his "Rhopalocera Malayana" ignores *graminifera* altogether.

In Indo-China, which includes Siam, *godartii* is the commonest species. Dr. Moore records *Crastia anymone*, Godart, originally described from Amboina, from Cochin China, a species I am quite unable to recognise from the original description, and Dr. Arnold Pagenstecher says in his paper on the butterflies of Amboina that he has not seen it from thence. Lastly, Dr. Moore describes a *Menama mouhotii* from Cambodia, of which I have a typical male from Chentaboon in Siam. This species has no male brand, and the wings are broader and more rounded than in typical *Crastia*. It therefore is an analogous species to *nicevillei* and *subdita*, and in my opinion is nothing but an aberrant form of *layardi* (= *binghami*), which again equals *godartii* (= *siamensis*). If my conjectures are right, it is very remarkable that the subgenus *Crastia* should have given rise to three aberrant forms in three well-defined regions, all differing one from the other and in different ways from the parent forms. *Crastia* appears to be in a highly plastic state.

From China proper five species have been recorded—*kinbergi*, Walengren, of which *lorquini*, Felder, and *felderi*, Butler, are I believe synonyms; *godartii*, Lucas (these two species occur together in Hongkong, and are I believe distinct); *anymone*, Godart, the Amboina species twice before mentioned; and *prunosa*, Moore. This latter is described from the very vague locality "China" apparently from a single male in M. Oberthür's collection. If it should be found to occur in Hongkong it will probably prove to be a synonym of *kinbergi*.

In the Nicobar Isles we have a single species of *Crastia*, the *scherzeri* of Felder, which was I believe originally wrongly labelled from Ceylon, and is therefore almost certainly the *camorta* of Moore.* It is not a true *Crastia*, as although it has the *Crastia* brand on the forewing in the male, it has as well the secondary sexual characters of *Menama* on the hindwing, which are not found in true *Crastia*.

* *Vide* de Nicéville, Journ. A.S.B., vol. lxviii, pt. 2, p. 178 (1899).

In Sumatra, the butterflies of the N.-E. portion of which are well-known to me in life,* only one species of *Crastia* is I believe to be found, the *distantii* of Moore; though *amymone*, Godart, described from Amboina, has been recorded from thence; and *inconspicua*, Moore, and *felderi*, Butler, have been both described from Sumatra. *C. felderi* certainly occurs in Hongkong and is a synonym of *lorquini*, Felder; while *C. inconspicua*, the description of which discloses a species apparently distinct from either *distantii* or *felderi*, having an immaculate forewing on the upperside, may have been wrongly labelled by Dr. A. R. Wallace, or occurs in a different part of the island to that with which I am familiar.

From Java two distinct species have been recorded—*godartii*, Lucas, which was I believe originally described from Java, but the work in which it is described is not in the Calcutta libraries, anyhow, it probably does not really occur in Java; and *haworthii*, Lucas (= *hübneri*, Moore, + *moorei*, Felder, + *janus*, Butler, = *eleusina*, Hübner, part, nec Cramer). In my collection I have but a single *Crastia* from Java, which I call *haworthii*, Lucas. It is extremely variable, in some male specimens the brand is almost half the length and quite half the breadth that it is in others, and the maculation also is not exactly the same in any two of my fourteen specimens. I think that Mr. W. F. Kirby in the new edition of Hübner's Ex. Schmett., pp. 6, 7, has misinterpreted the figures on pl. 222 (9) of that work. Figures 1 and 2 represent a male *Crastia* which will stand as *C. haworthii*, Lucas, = *hübneri*, Moore, = *moorei*, Felder, = *janus*, Butler; while figures 3 and 4 represent the female of *Selinda eleusina*, Cramer, the male of which is figured by Cramer in Ex. Lep., on plate cclxvi, fig. D. Mr. Kirby calls figs. 1 and 2 "*Selinda janus*, Butler," and figs. 3 and 4 "*Selinda eleusina*, Stoll [Cramer]. In Java only one species of *Crastia* appears to be found.

From the Philippines two species of *Crastia* have been recorded, *snelleni*, Moore, and *godartii*, Lucas, the latter almost certainly incorrectly.

TRAPSICHOIS, Hübner.

Himalayas,	}	<i>claudius</i> , Fabricius† (<i>linnæi</i> , Moore, <i>van-deventeri</i> , Forbes).
Oudh,		
Central Provinces,		
Assam,		
Burma,		
Malay Peninsula,		

* Vide de Nicéville, Journ. A.S.B., vol. lxiv, pt. 2, pp. 357-555 (1895).

† Vide Aurivillius, Ent. Tids., vol. xviii, p. 141, n. 7 (1897).

Indo-China,	}	<i>claudius</i> , Fabricius* (<i>linnæi</i> , Moore, <i>van-deventeri</i> , Forbes).
China,		
Formosa,		
Nicobar Isles,		
Sumatra,		
Bawean,		
Natuna Isles,		
New Guinea ?	}	

Ganjam on the E. coast of peninsular India, *kalinga*, Doherty.

Nias Isle, *verhuelli*, Moore.

Bali,	}	<i>basilissa</i> , Cramer.
Java,		

? Malay Peninsula,	}	<i>mulciber</i> , Cramer.
Billiton,		
Banka,		
Borneo,		

Engano Isle, *malakoni*, Doherty.

Mentawij Isles, *maassi*, Hagen.

Philippine Isles, *semperi*, Felder (*tisiphone*, Butler).

„	„	<i>diocletia</i> , Hübner (<i>dufresne</i> , Godart, <i>megilla</i> ,	
„	„	<i>kochi</i> , Moore.	[Erichson].
„	„	<i>visaya</i> , Semper.	
„	„	<i>mindanaensis</i> , Semper.	
„	„	<i>seraphita</i> , Fruhstorfer.	
„	„	<i>linnæi</i> , var. <i>paupera</i> , Staudinger.	

The subgenus *Trepsichrois* bears out my theory very well, no two species occurring in the same spot. The development of the subgenus is very remarkable in the different islands of the Philippine Archipelago, where the most aberrant and distinct species are found.

EUPLÆA, Fabricius.

Ceylon, *corus*, Fabricius (*elisa*, Butler).

Assam ? *vitrina*, Fruhstorfer ?

Burma, *vitrina*, Fruhstorfer.

Malay Peninsula, *castelnavi*, Felder (*phæbus*, Butler).

Indo-China, *drucei*, Moore.

Nicobar Isles, *castelnavi*, Felder.

Sumatra, *castelnavi*, Felder.

Nias Isles, *phæretena*, Kheil.

Engano, *micronesia*, Doherty.

* Vide Aurivillius, Ent. Tids., vol. xviii, p. 141, n. 7 (1897).

Java, *pavettæ*, Zinken-Sommer.

„ *gyllenhalii*, Lucas.

„ *castelnaui*, Felder.

Banka, *castelnaui*, Felder.

Borneo, *butleri*, Moore.

„ *godmani*, Moore.

Bawean, *castelnaui*, Felder.

Philippines (Palawan), *salvini*, Staudinger.

Celebes, *celebica*, Fruhstorfer.

Talaut Isles, *locupletior*, Fruhstorfer.

Engano Isle, *micronesia*, Doherty.

The subgenus *Euplœa* bears out my theory very well. It is true that three species have been recorded from Java and two from Borneo, but it is almost certain that only one species occurs in each island. Mr. Fruhstorfer in Stet. Ent. Zeit., vol. lx, p. 353 (1899), gives only *pavettæ* from Java and *butleri* from Borneo, which is almost certainly a correct statement of the facts.

CALLIPLÆA, Butler.

Lower Burma, *ledereri*, Felder (*inquinata*, Butler).

Malay Peninsula, *ledereri*, Felder.

Indo-China, *musa*, Swinhoe.

Sumatra, ? *ledereri*, Felder.

„ *eunus*, de Nicéville.

Java, *mazares*, Moore.

Bali, *mazares*, Moore.

Natuna Isles, *mazares*, Moore.

Borneo, *aristotelis*, Moore.

Lombok, *sambavana*, Doherty.

Sumba, *sumbana*, Doherty.

Batjan, *ledereri*, Felder.

Flores, *mazares*, Moore.

Philippines, *pollita*, Erichson.

„ *monilis*, Moore.

„ (Palawan), *palawana*, Fruhstorfer.

Hainan Island, China, *hainana*, Holland.

North China, *mariesis*, Moore.

The subgenus *Calliplœa* supports my theory very well, although the two first-named species occurring in the Philippine Archipelago are sometimes found on the same islands. It is very doubtful if two species are found in Sumatra, the recorded *ledereri* being probably my later-described *eunus*.

DANISEPA, Moore.

Eastern Himalayas,
Assam,
Burma,
Malay Peninsula,
Indo-China,
Sumatra,
Billiton,
Banka,
Natuna Isles,

} *diocletianus*, Fabricius (*radamanthus*,
Fabricius, *ramsayi*, Moore).

Nias Island, *schreiberi*, Butler (*maasseni*, Weymer, *niasana*, Swinhoe,
Java, *alcidice*, Godart (*thoosa*, Hübner). (*niasica*, Snellen).
Borneo, *lowei*, Butler.

Dr. Moore in Lep. Ind., vol. i, p. 114 (1891) records *D. schreiberi* [sic!] from Borneo, but that species is I believe strictly confined to Nias. Mynheer P. C. T. Snellen has written an interesting note on the subgenus *Danisepa* in Tijds. voor Ent., vol. xlii, pp. 101-105 (1899), but omits all reference to *D. schreiberi*, Butler, which is an older name than *D. niasica*, Snellen. I am unable, as Dr. Moore did in 1883, to draw any line between *diocletianus* and *radamanthus*. In 1890 he united these two species, but gave the latter name (*rhadamanthus*, sic!) precedence, while *diocletianus* in the older, and described *ramsayi* as a new species, restricting it to the Eastern Himalayas. That species gradually merges into *diocletianus*, though typical specimens have the white markings larger; but this is an inconstant character. Mr. W. F. Kirby points out in the new edition of Hübner's Ex. Schmett., p. 5, that in Godart's *D. alcidice* from Java no mention is made in the description of the white marginal spots on the forewing. This is probably an omission only, as no species of *Danisepa* is known from Java or elsewhere in which these spots are lacking, though they are blue rather than white. Kirby gives *D. thoosa* specific rank to the exclusion of the older *alcidice*. *Danisepa* supports my theory very well, as the several species nowhere overlap.

SALPINX, Hübner.

Lower Burma,
Malay Peninsula,
Western China,
Nicobar Isles,
Sumatra,

} *leucostictos*, Gmelin (*dehaanii*, Lucas,
novaræ, Felder, *vestigata*, Butler, *lazulina*,
Moore, *leucogonyx*, Butler).

- | | | |
|-------------------------------------|---|--|
| Nias Isle, | } | <i>leucostictos</i> , Gmelin (<i>dehaanii</i> , Lucas,
<i>novaræ</i> , Felder, <i>vestigata</i> , Butler, <i>lazulina</i> ,
Moore, <i>leucogonys</i> , Butler). |
| Java, | | |
| Bali, | | |
| Borneo, | | |
| Talaut Islands, | | |
| Borneo, <i>kadu</i> , | | Eschscholtz. |
| Engano Island, <i>phane</i> , | | Doherty. |
| Philippine Isles, <i>kadu</i> , | | Eschscholtz (<i>eunice</i> , Godart, <i>hewitsonii</i> ,
[Butler]. |
| " " | | <i>oculata</i> , Moore. |
| " " | | <i>simillima</i> , Moore. |
| " " | | <i>althæa</i> , Semper. |
| " " | | <i>meldolæ</i> , Moore. |
| Amboina, | | <i>leucostictos</i> , Gmelin. |
| Hainan Island, <i>negleyana</i> , | | Holland. |
| N. Formosa Island, <i>hobsoni</i> , | | Butler. |

In the Philippine Isles the various species of *Salpinx* occur together on several of the islands, which goes to disprove my theory; elsewhere the several species appear to inhabit well-defined separate areas, except in Borneo, where *leucostictos* and *kadu* are both found.

PADEMMA, Moore.

- | | | |
|----------------------------------|---|--|
| Behar, | } | <i>klugii</i> , Moore (<i>illustris</i> , Butler, <i>grantii</i> ,
Butler, <i>dharma</i> , Moore, <i>augusta</i> , Moore,
<i>indigofera</i> , Moore, <i>imperialis</i> , Moore, <i>regalis</i> ,
Moore, <i>maclellandi</i> , Moore, <i>uniformis</i> ,
Moore, <i>sherwillii</i> , Moore, <i>hamiltoni</i> ,
(Swinhoe). |
| Bengal (Maldah), | | |
| Sikkim hills, | | |
| Bhutan, | | |
| Assam, | | |
| Upper Burma, | | |
| Bengal (Maldah), | } | <i>klugii</i> , Moore, geographical race <i>erichsonii</i> ,
Felder (<i>crassa</i> , Butler, <i>masoni</i> , Moore, <i>pem-</i>
<i>bertoni</i> , Moore, <i>apicalis</i> , Moore, <i>burmeisteri</i> ,
Moore). |
| Assam, | | |
| Upper Burma, | | |
| Lower Burma, | | |
| Malay Peninsula, | | |
| Indo-China, | | |
| Sikkim, | } | <i>klugii</i> , Moore, geographical race <i>kollari</i> , Felder
(<i>rothneyi</i> , Moore). |
| Bengal, | | |
| Orissa, | | |
| South India, | | |
| Ceylon, <i>sinhala</i> , | | Moore. |
| Hainan Island, <i>minorata</i> , | | Moore. |

I have nothing to add to what I wrote on this subgenus nearly ten years ago. The two geographical races separated above are not strictly

geographically separated, as they overlap the typical form at certain points. The Ceylonese species can be satisfactorily separated from the continental form; the species from Hainan I have not seen.

ISAMIA, Moore.

- | | | |
|---|---|---|
| Nepal, | } | <i>rogenhoferi</i> , Felder (<i>splendens</i> , Butler, <i>irawada</i> , Moore). |
| Sikkim, | | |
| Bhutan, | | |
| Assam, | | |
| Upper Burma, | | |
| Central Burma, | } | <i>margarita</i> , Butler (<i>adamsoni</i> , Marshall, <i>brahma</i> , Moore, <i>carpenteri</i> , Moore). |
| Central Burma, | | |
| Lower Burma, | | |
| Malay Peninsula, | | |
| Indo-China, <i>grotei</i> , Felder (part, male only). | | |
| " " | | <i>margarita</i> , Butler. |
| " " | | <i>marseuli</i> , Moore. |
| " " | | <i>fabricii</i> , Moore. |
| Southern China, | { | <i>midamus</i> , Linnæus (<i>superba</i> , Herbst, <i>alopia</i> , Godart, <i>sinica</i> , Moore). |
| Northern China, | | |
| <i>dameli</i> , Moore. | | |
| Malay Peninsula, | } | <i>chloë</i> , Guérin (<i>ægyptus</i> , Butler, <i>dejeani</i> , Distant, <i>staudingeri</i> , Kheil, <i>rafflesi</i> , Moore, <i>singapura</i> , Moore, <i>sophia</i> , Moore, <i>lowei</i> , Moore). |
| Sumatra, | | |
| Nias Island, | | |
| Natuna Isles, | | |
| Java, | | |
| Banka, | | |
| Billiton, | | |
| Borneo. | | |
| Mantawej Isles, <i>sticheli</i> , Hagen. | | |

From the list given above it will be seen that it is only in Indo-China that more than one species of *Isamia* is found. *I. grotei*, male only, described from "Cochin" (Cochin China being evidently meant, not the district of that name in South India) is probably the same as *I. margarita*, Butler; *I. marseuli* is probably the same species; but *I. fabricii* belongs to quite another group (*i.e.*, to the *chloë* group), being entirely unglossed with blue on the upperside, which is a conspicuous feature in the other three species. Unfortunately I do not possess a single specimen of *Isamia* from any part of Indo-China, so am unable to speak about them from first-hand knowledge.

NARMADA, Moore.

Ceylon, *montana*, Felder (*lankana*, Moore).South India, *coreta*, Godart (*coreoides*, Moore).Sumatra, ? *consimilis*, Felder.,, *martinii*, de Nicéville.Java, *consimilis*, Felder.

I have seen no specimen of *N. consimilis* from Sumatra. *N. martinii* from that island is not a true *Narmada*, as the male sexual brands are not typical; nor does the shape of the wings agree with those of typical *Narmada*. I may mention that *N. coreta* does occur in Orissa, I have many specimens from thence. Dr. Moore notes in Lep. Ind., vol. i, p. 134, that its identification from thence "Is probably erroneous, and requires confirmation." *N. consimilis* seems to be extremely rare, I have seen no specimen of it.

STICTOPLEA, Butler.

Eastern Himalayas,	} <i>harrisii</i> , Felder (<i>grotei</i> , Felder, part, female only, <i>hopei</i> , Felder, <i>microsticta</i> , Butler, <i>binotata</i> , Butler, <i>regina</i> , Moore, <i>pygmæa</i> , Moore, <i>crowleyi</i> , Moore).
Assam,	
Burma,	
Malay Peninsula,	
Indo-China,	} <i>tyrianthina</i> , Moore.
Sumatra,	
Borneo,	

Palawan (Philippines), *dotata*, Fruhstorfer.Philippines, *lætifica*, Butler.,, *bazilana*, Fruhstorfer.Sumatra, *picina*, Butler.,, *inconspicua*, Butler.,, *mæsta*, Butler.

Java,	} <i>lacordairei</i> , Moore.
Sambawa,	

Formosa, *swinhoei*, Wallace.

S. tyrianthina is very doubtfully distinct from *S. harrisii*. Four species of *Stictopleæ* have been recorded from Sumatra. Out of the many hundreds of *Eupleæ*s which have passed through my hands from that island, I have seen but one species, which I identify as *tyrianthina*. *S. mæsta* is recorded from thence by Dr. Butler in Proc. Zool. Soc. Lond., 1866, p. 284, n. 49, p. 281, fig. 3, *male*, and Trans. Ent. Soc. Lond., third series, vol. v, p. 474, n. 51 (1867), and these records were overlooked by me in my paper on the butterflies of Sumatra in Journ. A.S.B., vol. lxiv, pt. 2, pp. 357-555 (1895). Dr. Moore gives it from New Guinea only. Notes by me on the Indian and Malay Peninsula

species of *Stictoplaea* will be found in Proc. A.S.B., 1892, pp. 158-161, and Trans. Ent. Soc. Lond., 1892, pp. 247-248.

I now return to the discussion of the various species of the subgenus *Tronga*, and will take up each of them in the order in which they were first described.

1. TRONGA CRAMERI, Lucas.

Euplaea crameri, Lucas, Rev. et Mag. de Zool., 1853, p. 318, *male*; id., Moore, Horsfield and Moore, Cat. Lep. Mus. E.I.C., vol. i, p. 129, n. 256 (1857), *male*; id., Butler, Proc. Zool. Soc. Lond., 1866, p. 277, n. 27; id., Druce, Proc. Zool. Soc. Lond., 1873, p. 338, n. 4; *Crastia crameri*, Butler, Journ. Linn. Soc. Lond., Zool., vol. xiv, p. 297, n. 7 (1878); id., Snellen, Notes Leyden Mus., vol. xvii, p. 118, n. 2 (1895); *Euplaea (Crastia) crameri*, Marshall and de Nicéville, Butt. of India, vol. i, p. 78, pl. viii, fig. 15, *male* (1882); *Tronga crameri*, Moore, Proc. Zool. Soc. Lond., 1883, p. 266, n. 1; idem, id., Lep. Ind., vol. i, p. 79 (1890); id., Fruhstorfer, Berl. Ent. Zeitsch., vol. xliii, p. 188 (1898).

HABITAT: Manilla (*Lucas*); Borneo (*Moore*); Borneo (*Butler*); Borneo (*Druce*); Natuna Isles (*Snellen*); Borneo (*Marshall and de Nicéville*); North and South Borneo, Mt. Mulu (*Fruhstorfer*).

This species was originally described from Manilla, in Luzon, the capital of the Philippines, but according to all authors including Herr G. Semper in Schmett. Philipp., p. 33 (1886), it is not found there. I have not had access to the original description, so do not know exactly what form of it M. Lucas described. The specimen I figured in 1882 may perhaps be typical, it has, on the upperside of the forewing, one discal spot in the second median interspace, and six submarginal spots, both the marginal and submarginal series on the hindwing obsolete. The specimen Dr. Moore has kindly marked for me as typical has eight submarginal spots on the forewing and a few (six) marginal spots on the hindwing, one belonging to the inner series. Dr. Butler notes that "The description by M. Lucas answers to Moore's species." It is extremely variable, even in Borneo, and has been given, in my opinion, nine synonymic names.

2. TRONGA KINBERGI, Wallengrén.

Euplaea kinbergi, Wallengrén, Wien. Ent. Monatsch., vol. iv, p. 35, n. 8 (1860); idem, id., Kongl. Svenska Fregatten Eugenies Resa, Zoologi, Insecta, pt. 4, p. 352, n. 4 (1861); id., Butler, Proc. Zool. Soc. Lond., 1866, p. 273, n. 11, p. 453; *Crastia kinbergi*, id., Journ. Linn. Soc. Lond., Zoology, vol. xiv, p. 297, n. 6 (1878); *Tronga kinbergi*, Moore, Proc. Zool. Soc. Lond., 1883, p. 269, n. 12; *Euplaea (Tronga) kinbergi*, Fruhstorfer, Berl. Ent. Zeitsch., vol. xli, p. 300 (1896).

HABITAT: China, December (*Wallengrén*); China (*Butler*); China (*Moore*); Tengger mountains, 2,000 feet, East Java (*Fruhstorfer*).

When describing this species, Wallengrén gave "China" as its habitat, which is very vague, but as most of the older writers had access to species from Southern China only, *T. kinbergi* probably came from the Canton district or from the Island of Hongkong, both in Southern China. He compares it with *E. alopia*, Godart, which is an *Isamia*. He does not give the sex of the type specimen. The description agrees very well with some of my specimens of the very variable *Euplœa* (*Crastia*) *lorquinii*, Felder (= *E. felderi*, Butler), the commonest species in Hongkong. Should this species prove to be same as *lorquinii*, Wallengrén's name will stand, being the older. Butler in 1866 recorded it from China, and noted that "*E. felderi* may be a local form of *E. kinbergi*, Wallengren," which is probably a correct assumption. Moore in 1883 gave it as a *Tronga* from China, and said that specimens were in the collection of the British Museum, but in 1890 he made no mention of it in "Lep. Ind." amongst the extra-Indian species of *Tronga*. Fruhstorfer recorded it from Java, which is almost certainly incorrect; as far as I know, no species of *Euplœa* is common to both China and Java, and there is no reason to suspect that *E. kinbergi* came from anywhere else than China.*

3. *TRONGA BREMERI*, Felder.

Euplœa bremeri, Felder, Wien. Ent. Monatsch., vol. iv, p. 398, n. 16 (1860); id., Butler, Proc. Zool. Soc. Lond., 1866, p. 277, n. 28; idem, id., Trans. Linn. Soc. Lond., Zool., second series, vol. i, pp. 535, 564, n. 6 (1877); id., Druce, Proc. Zool. Soc. Lond., 1873, p. 338, p. 5; id., Godman and Salvin, Proc. Zool. Soc. Lond., 1878, p. 638, n. 8; id., Distant, Rhop. Malay., pp. 23, 410, n. 2, pl. ii, fig. 4, male (1882, 1886); id., Marshall and de Nicéville, Butt. India, Burmah and Ceylon, vol. i, p. 78, n. 60 (1882); id., Marshall, Proc. A. S. B., 1882, p. 143, n. 60; id., Adamson, Notes *Danainæ* Burmah, p. 10 (1889); idem, id., Cat. Butt. Burmah, p. 5, n. 26 (1889); id., Hagen, Tijdsch. van het Kon. Ned. Aard. Genootsch., 1890, p. 191, n. 2; idem, id., Berl. Ent. Zeitsch., vol. xxxvii, p. 143, n. 8 (1892); idem, id., Iris, vol. vii, p. 41, n. 104 (1894); id., Pagenstecher, in Kükenthal's Erg. einer zool. Forsch. Molukken und in Borneo, p. 389, n. 109 (1897); *Crastia bremeri*, Butler, Journ. Linn. Soc. Lond., Zool., vol. xiv, p. 298, n. 9 (1878); *Tronga bremeri*, Moore, Proc. Zool. Soc. Lond., 1883, p. 267, n. 4, pl. xxix, fig. 5, male; idem, id., Journ. Linn. Soc. Lond., Zool., vol. xxi, p. 30 (1886); idem, id., Lep. Ind., vol. i, p. 76, pl. xix, figs. 1, 1a, 1b, male; 1c, 1d, female (1890); *E. (Tronga) bremeri*, Adamson, Cat. Butt. Burmah, p. 7, n. 15

* Since the above was written Professor Chr. Aurivillius has sent me a beautiful coloured drawing of the type specimen of *Euplœa kinbergi*, Wallengrén, this drawing I hope to reproduce in a later paper. It represents a female example of probably the commonest form of *Euplœa* found in Hongkong and on the opposite mainland of Southern China. The *Euplœa lorquinii* of Felder and *E. felderi* of Butler are synonyms of *E. kinbergi*. It is a *Crastia*, not a *Tronga*.

(1897); id., de Nicéville and Martin, Journ. A.S.B., vol. lxiv, pt. 2, p. 370, n. 19 (1895); *Tronga crameri bremeri*, Fruhstorfer, Berl. Ent. Zeitsch., vol. xliii, p. 188 (1898).

HABITAT: Malay Peninsula (*Felder*); Malayan Peninsula; India; Assam and Nepal (sic!); Malacca; Province Wellesley; Penang; Singapore; Borneo; Sumatra (*Butler*); Borneo; Peninsula Malayica (*Druce*); Billiton; Borneo; Malacca (*Godman* and *Salvin*); Assam; Burma; Province Wellesley; Malacca; Tenasserin (*Distant*); Mergui Archipelago; Penang; Malacca; Singapore; Borneo; Sumatra (*Marshall* and *de Nicéville*); Akyab, July (*Marshall*); Moulmain, June; Moumagan in Tavoy, September (*Adamson*); Deli on the east coast of Sumatra; Banka Island; Further India; Malacca (*Hagen*); Samarinda in Borneo (*Pagenstecher*); Malacca; Sumatra; India (*Butler*); Province Wellesley; Tavoy; Mergui, December to March, very common; Akyab, July; Thoungyeen forests in Upper Tenasserim; Mergui Archipelago, December to March; Malay Peninsula (*Moore*); Tavoy coast, September, common; Moulmain, one pair, June (*Adamson*); N.-E. Sumatra, plains to 1,500 feet (*de Nicéville* and *Martin*); Malacca; Sumatra; Natuna Isles (*Fruhstorfer*).

I consider this species to be a synonym of *T. crameri*, Lucas. It is extremely variable; Dr. Moore has devoted an entire plate to it in his Lep. Ind., which shews a few of these variations. Even its male secondary sexual characters are inconstant, as in Sumatra I have recorded that a few specimens have on the upperside of the forewing a short, sometimes quite a long and distinct, brand in the submedian interspace. These examples do not fit into Dr. Moore's definition of his genus *Tronga*, which is described and usually does not possess a sexual-mark or scent-producing organ. But these aberrant examples are certainly not distinct as species from the more common typical specimens of *T. bremeri*. This brand is sometimes present and sometimes absent in other species of *Euplœa*, as will be noticed hereafter. *T. bremeri* has been recorded from Assam and Nepal by Dr. Butler, but is not found further north than Akyab in Upper Burma.

4. TRONGA FRAUENFELDI, *Felder*.

Euplœa frauenfeldii, *Felder*, Verh. zool.-bot. Gesellsch. Wien, vol. xii, p. 479, n. 87 (1862); idem, id., Reise Nov., Lep., vol. ii, p. 342, n. 474, pl. xli, fig. 4, male (1865); id., *Marshall* and *de Nicéville*, Butt. Ind. Burmah and Ceylon, vol. i, p. 83, n. 66 (1882); id., *de Nicéville*, Journ. A.S.B., vol. lxviii, pt. 2, p. 178 (1899); *E. frauenfeldi*, *Butler*, Proc. Zool. Soc. Lond., 1866, p. 453; idem, id., Journ. Linn. Soc. Lond., Zool., vol. xiv, p. 300, n. 19 (1878).

HABITAT: Ceylon (*Felder*); Ceylon (*Marshall* and *de Nicéville*); Nicobar Isles (*de Nicéville*); Ceylon (*Butler*); Trincomalee (*Butler*).

Felder in 1862 described this species from Ceylon from a male collected by the officers of the "Novara" frigate which called at various ports. I believe that the specimen was incorrectly labelled, and really came from the Nicobars, where the "Novara" called, as no *Euplœa* answering to the description has since been found in Ceylon. Felder in 1865 redescribed both sexes of the species, retaining Ceylon as its habitat, but uniting to it his *E. esperi*, described from a female example from Kar Nicobar, though in his second description of *E. frauenfeldii* he omitted the Nicobars from the habitat of the species. In his 1866 monograph Dr. Butler noted quite correctly that the species is a local form of *E. crameri*, Lucas, and that it is very near to *E. bremeri*, Felder, as Felder said when describing it. In 1878 Dr. Butler recorded a male from Trincomalee in Ceylon. Dr. Moore described this specimen in his Lep. of Ceylon (where he gave *E. esperi* as a synonym), and again in his Lep. Indica, and figured it in the latter work. It is not *T. frauenfeldii*, having been wrongly identified, but is *Crastia kinbergi*, Wallengren, = *E. lorquinii*, Felder, and *E. felderi*, Butler. I am convinced that it never came from Ceylon, but was probably caught at Hongkong, where it is very common, by an officer of some man-of-war which subsequently visited the naval station of Trincomalee, and the specimen reached the British Museum from thence. *E. esperi* is undoubtedly a synonym of *E. frauenfeldii*, as also is *Tronga biseriata*, Moore.

T. frauenfeldii may be retained as a species or good local race of *T. crameri*, Lucas, as all the white spots on the forewing are very small and nearly uniform in size, while in *E. crameri* the spots of the submarginal series in the forewing are irregular in size, several of those towards the apex of the wing being much larger than the others. It is found in the Nicobar isles only, occurring on most of the islands. It has a sexual brand in the male in the forewing in the submedian interspace in some specimens, which is variable in size and prominence, and wholly absent in others. Those bearing this brand are considered by Dr. Moore to represent a distinct species, which he has called *T. biseriata*. As noted by me in several places in this paper, this brand is very inconstant in many groups of *Euplœas*, and cannot be relied on to separate genera or subgenera by.

5. TRONGA ESPERI, Felder.

Euplœa esperi, Felder, Verh. zool.-bot. Gesellsch. Wien, vol. xii, p. 482, n. 109 (1862); id., Butler, Proc. Zool. Soc. Lond., 1866, p. 453*; id., Moore, Proc. Zool. Soc.

* Omitted altogether by Dr. Butler in his 1878 revision of the butterflies of the genus *Euplœa* in the collection of the British Museum.

Lond., 1877, pp. 582, 623; id., Wood-Mason and de Nicéville, Journ. A.S.B., vol. 1, pt. 2, p. 227, n. 8 (1881); vol. li, pt. 2, p. 15, n. 7 (1882); id., Marshall and de Nicéville, Butt. India, Burmah and Ceylon, vol. i, p. 83, n. 65 (1882); id., de Nicéville, Journ. A.S.B., vol. lxxviii, pt. 2, p. 178 (1899); *Crastia esperi*, Moore, Proc. Zool. Soc. Lond., 1883, p. 278, n. 6; idem, id., Lep. Ind., vol. i, p. 88, pl. xxvii, figs. 2, 2a, male; 2b, female (1890).

HABITAT: Kar Nicobar (*Felder*); Nicobar Islands (*Butler*); Kar Nicobar, Nicobars (*Moore*); Pulo Kondul, Kamorta, Trinkut, Katschall (*Wood-Mason and de Nicéville*); Nicobars (*Marshall and de Nicéville*); Nicobar Isles (*de Nicéville*); Kar Nicobar, Kamorta (*Moore*).

This species is, in my opinion, a synonym of *E. frauenfeldii*, *Felder*, to which *Felder* himself united it, as also did *Dr. Moore* in 1880. *Felder* compared it with the Philippine [sic] *E. crameri*, *Lucas*. For further notes regarding it see the last species.

6. TRONGA JOHANNA, Kirby.

Euplœa johanna, Kirby, Syn. Cat. Diurn. Lep., p. 17, n. 131 (1871); id., Kheil, Rhop. Nias, p. 17 (1884); id., Fruhstorfer, Berl. Ent. Zeitsch., vol. xliii, p. 189 (1898).

HABITAT: Borneo (*Kirby*).

Mr. W. F. Kirby renamed the *Euplœa crameri*, *Moore*, described in *Horsfield and Moore's Cat. Lep. Mus. E.I.C.*, vol. i, p. 129, n. 256 (1857), from Borneo, as he considered it to represent a species distinct from the earlier *E. crameri* of *Lucas*, from Manilla in the Philippines, this locality, as previously noted, being in all probability incorrect. As, however, *Dr. Moore* says that his *E. crameri* is the same species as that of *Lucas*, *Kirby's E. johanna* falls to it as a synonym.

7. TRONGA BISERIATA, Moore.

T. biseriata, *Moore*, Proc. Zool. Soc. Lond., 1883, p. 266, n. 2; idem, id., Lep. Ind., vol. i, p. 78, pl. xxi, figs. 1, 1a, 1b, male; 1c, 1d, female (1890); id., de Nicéville, Journ. A.S.B., vol. lxxviii, pt. 2, p. 178 (1899); *Tronga crameri biseriata*, *Fruhstorfer*, Berl. Ent. Zeitsch., vol. xliii, p. 188 (1898).

HABITAT: Trinkut, Great Nicobar, Little Nicobar, Nancoury, Pulo Kondul—all in the Nicobar Isles (*Moore*); Nicobars (*de Nicéville*); Nicobars (*Fruhstorfer*).

I have said all that is necessary about this species under *T. frauenfeldii*, *Felder*, of which it is a synonym.

8. TRONGA MARSDENI, Moore.

T. marsdeni, *Moore*, Proc. Zool. Soc. Lond., 1883, p. 266, n. 3; idem, id., Lep. Ind., vol. i, p. 79 (1890); *Euplœa marsdeni*, *Distant*, Rhop. Malay., p. 411, n. 18,

pl. xxxix, fig. 1, male (1886); *Tronga crameri marsdeni*, Fruhstorfer, Berl. Ent. Zeitsch., vol. xliii, p. 188 (1898).

HABITAT: Singapore (*Moore*); Singapore (*Distant*); Singapore (*Fruhstorfer*).

Mr. Distant allows this species full specific rank, and says he has received two specimens from Singapore, which both differ from the type specimen described by Dr. Moore from the same island, which shews that this "species" is as variable as most of the other species in the subgenus. In my opinion it is a synonym of *T. crameri*, Lucas, which species (as *E. bremeri*, Felder), has been recorded by several authors from numerous localities in the Malayan Peninsula. It is highly improbable that Singapore island, which has hardly a scrap of virgin forest remaining, has a distinct species of *Tronga* to itself. Dr. Moore says that it is "An intermediate form between *T. bremeri*, Felder, and *T. crameri*, Lucas."

9. *TRONGA OLIVACEA*, Moore.

T. olivacea, Moore, Proc. Zool. Soc. Lond., 1883, p. 267, n. 5; id., Fruhstorfer, Berl. Ent. Zeitsch., vol. xliii, p. 189 (1898).

HABITAT: Minthantoung, Thoungyeen valley, Tenasserim (*Moore*).

This species was described from a single very small female specimen. Dr. Moore in Lep. Ind., p. 76, admits that it is a "small var." of *T. bremeri*, Felder, which itself is a synonym of *T. crameri*, Lucas.

10. *TRONGA NIASICA*, Moore.

T. niasica, Moore, Proc. Zool. Soc. Lond., 1883, p. 267, n. 7; idem, id., Lep. Ind., vol. i, p. 79 (1890); *Euplœa niasica*, Kheil, Rhop. Nias, p. 17, n. 13, pl. i, fig. 2, female (1884); *Tronga pryeri niasica*, Fruhstorfer, Berl. Ent. Zeitsch., vol. xliii, p. 189 (1898).

HABITAT: Nias Island, W. coast of Sumatra (*Moore*); Nias (*Kheil*); Nias (*Fruhstorfer*).

I have eight males, but no females, of this species. The markings are more constant than usual, though they vary considerably in detail, for instance, the submarginal dots on the hindwing may form a complete series or may be reduced to a solitary spot, and there are intergrades between these two extremes; the spots on the forewing vary also in size and number. The species may, perhaps, be kept distinct, as the spots in the forewing are more uniform in size than in the other species of the subgenus known to me, except *T. frauenfeldii*, Felder, in which they are constantly smaller.

11. *TRONGA BROOKEI*, Moore.

T. brookei, Moore, Proc. Zool. Soc. Lond., 1883, p. 268, n. 8; idem, id., Lep. Ind., vol. i, p. 79 (1890); id., Fruhstorfer, Berl. Ent. Zeitsch., vol. xliii, p. 188 (1898).

Dr. Moore has kindly identified a male specimen of this species for me from Sarawak, Borneo, and marked it "Same as type," though it does not agree with the type, as in the forewing it has no marginal series of spots, in the type they are said to be present but "very minute." Mr. Fruhstorfer says that *Tronga brookei* is identical with *Menama lorzæ*, Moore. This is entirely incorrect, the genus *Menama* has a sexual patch of androconia on the upperside of the hindwing not found in *Tronga*, *brookei* is a *Tronga*, and *lorzæ* is a *Menama*. I consider *T. brookei* to be a synonym of *T. crameri*, Lucas. Dr. Moore says it is "Comparatively smaller and narrower winged than *T. crameri*; of a paler brown colour, and with a violet-blue tint."

12. *TRONGA LABUANA*, Moore.

T. labuana, Moore, Proc. Zool. Soc. Lond., 1883, p. 268, n. 9; idem, id., Lep. Ind., vol. i, p. 80 (1890); id., Fruhstorfer, Berl. Ent. Zeitsch., vol. xliii, p. 189 (1898).

HABITAT: Labuan, Borneo (*Moore*).

Dr. Moore has identified a male specimen of this species for me from Sarawak, Borneo. Though marked "Same as type" it does not agree exactly with the description of the type; and it would be extraordinary perhaps if it did, as in these Borneo *Trongas* I cannot find two marked exactly alike. Mr. Fruhstorfer says that this species is a synonym of *T. crameri*, Lucas, wherein I agree with him.

13. *TRONGA DAATENSIS*, Moore.

T. daatensis, Moore, Proc. Zool. Soc. Lond., 1883, p. 268, n. 10; idem, id., Lep. Ind., vol. i, p. 80 (1890); id., Fruhstorfer, Berl. Ent. Zeitsch., vol. xliii, p. 189 (1898).

HABITAT: Island of Daat, Labuan, Borneo (*Moore*).

Dr. Moore, not having access to the type of this species, was unable to match it with any of the Bornean *Trongas* I sent to him. As, however, from the description it only appears to differ from other Borneo *Trongas* in some slight details of maculation I concur with Mr. Fruhstorfer in considering it to be a synonym of *T. crameri*, Lucas.

14. *TRONGA PRYERI*, Moore.

T. pryeri, Moore, Proc. Zool. Soc. Lond., 1883, p. 269, n. 11; idem, id., Lep. Ind., vol. i, p. 80 (1890); id., Fruhstorfer, Berl. Ent. Zeitsch., vol. xliii, p. 189 (1898);

Euplœa bremeri, var. *pryeri*, Distant and Pryer, Ann. and Mag. of Nat. Hist., fifth series, vol. xix, p. 47, n. 12 (1887).

HABITAT: Sandakan, Borneo (*Moore*); North Borneo (*Fruhstorfer*); Sandakan, Borneo (*Distant* and *Pryer*).

Dr. Moore has sent me a sketch of the type male of this species, none of the specimens I sent to him being identical. Its chief peculiarity appears to be the presence of a complete double series of rather large spots on the hindwing. Mr. Fruhstorfer takes *T. pryeri* as the type of his second division of the genus *Tronga*, based on this character, and gives *heylærtsii*, Moore, *niasica*, Moore, *mentawica*, Hagen, and *nicévillei*, Moore, as subspecies of *pryeri*, though why he gives *pryeri* precedence over *niasica*, the latter being the older species, and *brookei* over *lorzæ* for the same reason, is best known to himself. Though I sent no typical specimens of *T. pryeri* from Borneo to Dr. Moore, I possess several of both sexes that agree with his description and sketch of that species, and it is in my opinion another synonym of *T. crameri*, Lucas.

15. TRONGA HEYLÆRTSII, Moore.

T. heylærtsii, Moore, Lep. Ind., vol. i, p. 79 (1890); *E. (Tronga) heylærtsii*, de Nicéville and Martin, Journ. A.S.B., vol. lxiv, pt. 2, p. 371, n. 21 (1896); *T. pryeri heylærtsii*, Fruhstorfer, Berl. Ent. Zeitsch., vol. xliii, p. 189 (1898).

HABITAT: Sumatra (*Moore*); Sumatra (*de Nicéville* and *Martin*); Sumatra; Malacca (*Fruhstorfer*).

From the description alone I can identify this species without difficulty, as it is the commonest form of *Tronga* occurring in Sumatra. It is another synonym of *T. crameri*, Lucas.

16. TRONGA PAGENSTECHERI, Hagen.

Euplœa pagenstecheri, Hagen, Jahr. des Nass. Ver. für Natur., vol. xlix, p. 182, n. 18, pl. iv, fig. 8, male (1896); *Tronga crameri pagenstecheri*, Fruhstorfer, Berl. Ent. Zeitsch., vol. xliii, p. 188 (1898).

HABITAT: Bawean Island (*Hagen*); Bawean (*Fruhstorfer*).

I have not seen this species. Dr. Hagen says that it comes into Moore's subgenus *Menama*, near *M. lorzæ*, Moore, [nec Boisduval], while Fruhstorfer puts it in the subgenus *Tronga*.

17. TRONGA MENTAWICA, Hagen.

Euplœa (Tronga) mentawica, Hagen, Ent. Nach., vol. xxiv, p. 199 (1898); *Tronga pryeri mentawica*, Fruhstorfer, Berl. Ent. Zeitsch., vol. xliii, p. 189 (1898).

HABITAT: Mentawej Islands (*Hagen*); Mentawej (*Fruhstorfer*).

I have not seen this species.

18. *TRONGA MORRISI*, Hagen.

Euploea (*Tronga*) *morrissi*, Hagen, Ent. Nach., vol. xxiv, p. 199 (1898); *Tronga morrissi*, Fruhstorfer, Berl. Ent. Zeitsch., vol. xliii, p. 188 (1898).

HABITAT: Mentawej Islands (*Hagen*); Mentawej (*Fruhstorfer*).

This species also I have not seen. It is highly improbable I think that two distinct species of *Tronga* inhabit one tiny group of islets lying to the south of the central portion of Sumatra. Should one prove to be a *Tronga* and the other a *Menama* the occurrence of two closely-allied but subgenerically distinct species would be accounted for.

19. *TRONGA TENGGERENSIS*, Fruhstorfer.

T. crameri tenggerensis, Fruhstorfer, Berl. Ent. Zeitsch., vol. xliii, pp. 187, 188 (1898).

HABITAT: Tengger mountains, 2,000 feet, East Java (*Fruhstorfer*).

I have seen no specimen of this species. See remarks on p. 14.

20. *TRONGA BISERIATA*, Fruhstorfer.

T. crameri, ab. *biseriata*, Fruhstorfer, Berl. Ent. Zeitsch., vol. xliii, pp. 187, 188 (1898).

HABITAT: East Java (*Fruhstorfer*).

Mr. Fruhstorfer describes this as an "aberration" of *T. crameri*, Lucas, which latter he records from "North and South Borneo, Mt. Mulu," only, and not from Java at all. Probably he intends it to be understood that it is an aberration of his *tenggerensis* rather than of *crameri*. There is already a *Tronga biseriata* (see n. 7, p. 34) of Moore, so as a distinct species it cannot stand in any case. I have not seen it.

The two following species have been described in the genus *Tronga*:—

1. *Tronga moorei*, Butler, *vide* Moore, Proc. Zool. Soc. Lond., 1883, p. 267, n. 6, is a *Menama*.

2. *Tronga nicevillei*, Moore, Lep. Ind., vol. i, p. 77, pl. xx (1890), is an aberrant *Crastia* in my opinion.

Also *Menama mouhotii*, Moore, Proc. Zool. Soc. Lond., 1883, p. 265, n. 7, pl. xxxi, fig. 6, male, is in my opinion another aberrant *Crastia*.

IV.—*Noviciæ Indicæ XVIII. The Asiatic species of Dalbergia.*—

By D. PRAIN.

[Received 22nd April, 1901 ; Read June, 1901.]

The writer, at such intervals during the past four years as have offered themselves in the routine of administrative duties, has given attention to the species of the genus *Dalbergia* that occur in S.-E. Asia. In the course of this study he has received much assistance from many friends and has been in hopes of incorporating the results of his investigation in a monograph of at least the Asiatic Species of this genus, so interesting from an economic and so difficult from a taxonomic point of view. Circumstances for the moment forbid the accomplishment of this design. But while it is, at this time, impossible to provide a monograph of the genus which shall be, at least formally, complete, it is a pleasant duty to place at the disposal of members of this Society and of those who have so kindly assisted the writer, a compact review of the notes he has been able to make on collections that have been lent him for study in Calcutta or that he has been able to examine in Herbaria that he has visited. These notes, as embodied in this paper, take the form of a hand-list of the Asiatic species of the genus, with a fairly complete bibliography and a full citation of distribution so far as the specimens in the Collections examined by the writer are concerned. Except in the case of very well-known and obvious species the numbers of sheets, where numbers are given, have been quoted. In spite therefore of its formal incompleteness the list now prepared will probably be found useful, not only by those who may consult the collections on which the list is based, but by those who may be at work in Herbaria that have not yet been accessible to the writer. A list like the present serves, moreover, another purpose; it fulfils the desirable object of, in the words of a Russian proverb, "feeding the wolves and saving the sheep."

The Herbaria examined by the writer on the spot have been those of 1. Calcutta; 2. Kew; 3. British Museum; 4. The type Herbarium of Wallich; 5. the Herbarium of Linnæus; 6. M. Drake del Castillo, Paris; 7. Peradeniya, Ceylon. The collections which have been entrusted to him for examination at Calcutta are those of 8. Herb. Saharanpur, lent by Mr. Duthie; 9. Herb. DeCandolle, Geneva, lent by Mr. DeCandolle, and 10. Herb. Boissier, Geneva, lent by Mr. Barbey; 11. Herb. Beccari, Florence, lent by Sig. Beccari; 12. Herb. Paris, lent by M. Bureau; 13. Herb. Leiden, lent by the late Prof. Suringar; 14. Herb. Berlin, lent by Prof. Engler; 15. Herb. Buitenzorg,

lent by Dr. Treub; 16. Herb. Hong-Kong, lent by Mr. Ford. To all these friends and also to Mr. Bailey who kindly sent specimens of the only *Dalbergia* in the Brisbane Herbarium the writer wishes to express his grateful thanks.

It may be explained that the classification adopted in this list should be considered more or less tentative. The chief point, at this stage, is to arrive if possible at something approaching a definite idea of the various species. This, as will be seen from the quoted synonymy, has long been a desideratum; previous treatises have left many doubts both as to the limits of species and as to the incidence of names. That the present sketch is not without flaws in this respect goes without saying. The opportunities, however, which have been afforded the writer of examining the actual types of most of the doubtful forms have enabled him to settle definitely many if not all the old doubts; any new ones that may arise must be laid to his charge. The leading features of the present system of classification are (1) the reinstatement of Mr. Bentham's very natural subgenus *Triptolemea*, and (2) the limitation of the subgenus *Selenolobium* to those species that have thick corky pods. There is an obvious convenience in keeping alongside of each other three species so clearly and naturally allied as are *D. reniformis*, *D. Kunstleri* and *D. falcata* though, from the fact that the stamens of the first are iso-diadelphous while those of the second and apparently also the third are monadelphous, we have within this section a cleavage on another plane, corresponding exactly to the cleavage between *Dalbergaria* and *Sissoa*. The other species that have been occasionally placed in *Selenolobium* owing to their having hard woody pods, not obviously winged, but that do not have the ventral suture markedly widened in consequence of a corky thickening of the endocarp, are all species that occur on sea-shores or in tidal estuaries and are with hardly an exception confined to such localities. This raises a strong suspicion that the character is a consequence of environment; it is at all events a character that adapts the pods for dispersal by floating. If this suspicion should prove correct the value of the character as a taxonomic one is greatly minimised. Such species have therefore been relegated to those sections in which their characters of corolla and stamens would naturally lead us to place them. Within the subgenus *Sissoa* a new section, that of the *Unguiculatæ*, has been tentatively recognised; it promises to be a useful and appears to be a natural division.

I. *SISSOA* Benth.

1. *Sissoæ veræ*.

1. *DALBERGIA* *SISSOO* Roxb. *Hort. Beng.* 53 (1814); *DC. Prodr.*

ii. 416 (1825); *Roxb. Flor. Ind.* iii. 223 (1832); *Wall. Cat.* 5850 (1832); *W. & A. Prodr.* i. 264 (1834); *Grah. Cat. Bomb. Pl.* 55 (1839); *Voigt, Hort. Suburb. Calcutt.* 241 (1845); *Benth. Journ. Linn. Soc. iv. Suppl.* 40 (1860); *Dalz. & Gibs. Bombay Flora, Suppl.* 24 (1861); *Bedd. Flor. Sylvat.* t. 25 (1869); *Stewart, Panjab Plants* 65 (1869); *Brandis, For. Flor.* 149 (1874); *Bak. in Hook. f. Flor. Brit. Ind.* ii. 231 (1876); *Talbot, Bombay List* 74 (1894); *Gamble, Darjeeling List* 28 (1896).

WILD in gravelly river beds along the foot of the Himalaya from Upper Assam (*Simons! Mann!*) the Duars (*Prain!*) the Terai of Sikkim (*Gamble! Clarke! etc.*), and Nepal (*Wallich!*) to Dehra Dun (*King!*): ascending to 1000 feet in the Eastern Himalaya (*Hooker!*) and to 3000-4000 feet in the North-West Himalaya (*Gamble! Clarke! Schlich!*) and on the North-West frontier and Beluchistan (*Stocks! Lace!*). Wild also in Merwara (*Moir! Brandis!*). Specimens from the Sitapahar Forest Reserve, Chittagong, (*Ellis!*) are probably from planted trees. CULTIVATED everywhere in the plains of Northern, Central, Western and Southern India; occasionally as if wild in Coorg (*Hohenacker n. 785!*) and the Nilgiris (*Wight!*).

2. *DALBERGIA LATIFOLIA* *Roxb. Coromand. Pl.* ii. 7, t. 113 (1798); *Hort. Beng.* 53 (1814); *DC. Prodr.* ii. 416 (1825); *Flor. Ind.* iii. 221 (1832); *Wall. Cat.* 5852 (1832); *W. & A. Prodr.* i. 264 (1834); *Grah. Cat. Bomb. Pl.* 55 (1839); *Voigt, Hort. Suburb. Calcutt.* 240 (1845); *Wight, Ic.* t. 1156 (1852); *Benth. Journ. Linn. Soc. iv. Suppl.* 38 (1860); *Dalz. & Gibs. Bomb. Flor.* 77 (1861); *Bedd. Flor. Sylvat.* t. 24 (*excl. main fig.*) (1869); *Brandis For. Flor.* 148 (1874); *Bak. in Hook. f. Flor. Brit. Ind.* ii. 231 (1876); *Talbot, Bombay List* 74 (1894); *Gamble, Darjeeling List* 29 (1896).

RAJPUTANA: Merwara, *Brandis!* Aboo, *King!* NEPAL: *Maries!* SIKKIM: *Hooker! Gamble!* CHOTA NAGPUR: *Parasnath, Anderson! Hooker!* Tundi Hills, *Campbell!* Hundrugagh, *Prain!* Palamau, *Gamble!* N. INDIA: *Jacquemont* 731! 1386! BEHAR: *Hooker!* BUNDELCUND: *Edgeworth.* S. INDIA: Madras; *Heyne!* Nilgiris, *Leschenault* 246! *Wight* 930! *Gamble!* Ayamalais, near Coimbatore, *Wight!* Mercara, *Metz* (*Hohenacker* 622)! W. INDIA: Kala Nadi, *Ritchie!* Concan; *Stocks!* *Law!* CULTIVATED at Singapore, *Ridley* 8444!

3. *DALBERGIA EMARGINATA* *Roxb. Hort. Beng.* 53 (1814); *Flor. Ind.* iii. 224 (1832); *Voigt, Hort. Suburb. Calcutt.* 241 (1845). *D. sissoides* *Grah. in Wall. Cat.* 5876 (1832); *W. & A. Prodr.* i. 265 (1834); *Benth. Journ. Linn. Soc. iv. Suppl.* 39 (1860); *Bedd. Trans. Linn. Soc.* xxv. 216 (1865). *D. javanica* *Miq. Flor. Ind. Bat.* i. 132 (1855); *Benth. Journ. Linn. Soc. iv. Suppl.* iv. 38 (1860). *D. latifolia* *Kurz, For. Flor. Brit. Burm.* i. 342 (1877); *Koord. & Valet. Bijdr.* ii. 77 (1895) *nec* *Roxb.*

D. latifolia VAR. *sissooides* *Bedd. Flor. Sylvat.* sub. t. 24 (1869); *Bak. in Hook. f. Flor. Brit. Ind.* ii. 231 (1876).

ANDAMANS: probably north Island, *Kyd* (*Ic. Roxb.*)! JAVA; *Horsfield!* *Koorders!* *Heijer!* S. INDIA: Nilgiris, *Wight* 931! *Segur, Clarke* 11305! *Pulneys, near Kodaikanal, Bourne!* *Courtallam, Wight!*

4. *DALBERGIA SACERDOTUM* *Prain*. A tree, the young twigs soft, blackish, faintly puberulous. *Leaves* 20 cm. long, leaflets 9–11, ovate, base cuneate apex obtuse notched, membranous, finely reticulated, sparsely adpressed-puberulous on both surfaces, 6 cm. long, 3 cm. wide; rachis 15 cm. long and petiolules 4 mm. long finely puberulous. *Flowers* in terminal thyrscoid panicles 8 cm. long 6 cm. wide, the peduncle, branches and slender pedicels rusty-puberulous; bracteoles lanceolate obtuse, membranous, deciduous. *Calyx* campanulate, teeth obtuse, the lowest as long as tube the others shorter. *Petals* short-clawed, standard orbicular hardly thickened at base. *Stamens* 10, monadelphous. *Ovary* shortly stipitate, glabrous except the stipe; ovules 4. *Pod* thinly coriaceous, narrow-ligulate, tapering to the stipitate base, apex acute, glabrous, 3-seeded, 9 cm. long, 1 cm. wide.

CHINA: Shanghai, *Rev. pp. Hélot & d'Argy* 75!

The reverend gentlemen who collected the material on which this very distinct species is based, give its Chinese name as Te-Zü, i.e., "Aloes-Wood." Its nearest ally is *D. Sissoo* as regards pod and *D. emarginata* as regards foliage but it is very different from both.

5. *DALBERGIA OBTUSIFOLIA* *Prain*. *D. ovata* VAR. *obtusifolia* *Bak. in Hook. f. Flor. Brit. Ind.* ii. 231 (1876). *D. glauca* *Kurz, For. Flor. Brit. Burm.* i. 343 (1877), *nec Wall.*

BURMA: Pegu, *Kurz* 1784! 2607 in part! Pakehoung, *Brandis* 228! Shan Hills; Madoe and elsewhere, *King's Collectors!* Lower Chindwin, *Collectors of Forest Dept.!* Hukung Valley, *Griffith* 1809! CHINA: Yunnan, near Momien, *J. Anderson!*

Griffith notes this as a "medium tree."

6. *DALBERGIA TONKINENSIS* *Prain*. A small or medium-sized tree. *Leaves* 20–22 cm. long, leaflets 9–11, ovate, base rounded, apex shortly abruptly acuminate, firmly subcoriaceous, very sparingly puberulous when young, soon glabrous, 6–9 cm. long, 3–4 cm. wide; rachis 13–15 cm. long, and petiolules 4 mm. long glabrous; stipules small, tawny-puberulous, deciduous. *Flowers* "white, fragrant," in small, corymbose, axillary panicles 5 cm. long, 3.5 cm. wide. *Pods* firmly coriaceous, ovate or oblong, subacute, distinctly stipitate, 5 cm. long when 1-seeded, 8 cm. long when 2-seeded, 2 cm. wide, distinctly reticulated opposite the seed. *Seed* reniform, compressed, 1 cm. long, 5 mm. wide. *Dalbergia* sp. *Drake del Castillo, Journ. de Bot.* v. 215 (1891).

COCHIN-CHINA: Tonkin, Hanoi; *Balansa* 2184! CHINA: Hainan, *B. C. Henry* 46!

The absence of flowers, which are simply noted by the Rev. Henry as white and fragrant, renders it impossible to locate this species definitely. It appears, however, as if Mr. Drake del Castillo's suggestion as to its affinity might be correct and that it is a *Sissoa*, near *D. ovata* and *D. obtusifolia*.

7. *DALBERGIA OVATA* *Grah. in Wall. Cat.* 5854 (1832); *Benth. in Journ. Linn. Soc. iv. Suppl.* 40 (1860); *Bak. in Hook. f. Flor. Brit. Ind. ii.* 231 (1876); *Kurz, For. Flor. Brit. Burma i.* 343 (1877). *D. glauca* *Wall. Cat.* 5862 (1832).

BURMA: Martaban, *Wallich* 5854! Moulmein, *Wallich* 5862! *Fulconer* 566! *Parish* 340! *Beddome*! Rangoon, *Cleghorn*! Yainway, *Brandis* 1185! Thoungyne, 3000 ft., *Lobb*! Pegu, *Kurz* 1785! 2607 in part! 2610! 2595! COCHIN-CHINA: route between Saigon and Bienhoa, *Lefèvre* 320!

Beddome notes this as a "large tree."

8. *DALBERGIA FOLIACEA* *Wall. Cat.* 5856 partly (1832); *Benth. Journ. Linn. Soc. iv. Suppl.* 41 (1860); *Bak. in Hook. f. Flor. Brit. Ind. ii.* 232 (1876); *Kurz, For. Flor. Brit. Burma i.* 347 (1877).

BURMA: Martaban, *Wallich*! Palang Creek, *Wallich*! Pegu, *Kurz* 2602! Rangoon, *Cleghorn* 25! Shan Hills, *Prazer* 210! 233! *Abdul Hug*! Tenasserim, *Helper* 1806! SIAM: borders of the Great Lake, *Godefroy* 686!

Wallich's n. 5865 is much mixed. Letter A. is a mélange of *D. foliacea*, *D. stipulacea*, *D. candanensis* and *D. volubilis*; B. is a mixture, probably by mistake, of *D. rimosa* and *D. volubilis*; C. is *D. foliacea*; D. is *D. foliacea*; E. is *D. stipulacea*. The mixture of *D. rimosa* with *D. foliacea*, which in most collections has taken place under B, has in *Herb. De Candolle* been made by *Wallich* under D. That it is in all probability a mistake in distributing may be admitted; *D. rimosa* does not occur in Southern Burma where *D. foliacea* grows. The other mistakes are mistakes of identification on Dr. *Wallich's* part.

9. *DALBERGIA YUNNANENSIS* *Franch. Pl. Delavay.* 187 (1890).

CHINA: Yunnan, near Tapintze, *Delavay* 654! 510! 2050! Yen-tze-hay, *Delavay* 3333! Mengtze, *Henry* 10205!

10. *DALBERGIA VELUTINA* *Benth. var. typica* *Prain, Journ. As. Soc. Beng. lxi.* 2. 117 (1897). *D. velutina* *Benth. Pl. Jungh. i.* 255 (1854); *Journ. Linn. Soc. iv. Suppl.* 43 (1860); *Bak. in Hook. f. Flor. Brit. Ind. ii.* 233 (1876); *Kurz, For. Flor. Brit. Burma i.* 348 (1877). *D. stipulata* *Wall. Cat.* 5868 (1832). *Cassia timorensis* *H. f. & T. Herb. Ind. Or., partly.*

ASSAM: Silhet, *de Silva*! *Hooker & Thomson*! BURMA: Moulmein,

Wallich ! Amherst, Brandis ! Rangoon, Kurz ! Pegu, Kurz ! Tenasserim, Helfer 1804 ! MALAYA : Malacca, Maingay 548 !

VAR. *Maingayi* Prain, *Journ. As. Soc. Beng.* lxvi. 2. 117 (1897).

BURMA : Mergui, Griffith 1798 ! Tenasserim, Helfer 1804 ! MALAYA : Malacca, Maingay 612 ! Singapore, Ridley 6086 ! 5923 ! Borneo, Haviland 1444 !

Helfer 1804 in Herb. Berlin is typical *D. velutina*. In Herb. Paris the same number is attached to a specimen of VAR. *Maingayi*. The Bornean plant may be varietally distinct.

11. *DALBERGIA BORNEENSIS* Prain. A long climber with perfectly glabrous branches. *Leaves* 8–12 cm. long, leaflets 7–9, oblong, obtuse, mucronulate, membranous, quite glabrous on both surfaces, 2·5 cm. long, 1·25 cm. wide, the terminal more cuneate at base and slightly larger than the others ; stipules large, sparingly puberulous or glabrous ; rachis 8 cm. long and petiolules 2·5 mm. long glabrous. *Flowers* in lax lateral panicles with corymbose branches 6 cm. long, 4 cm. wide, the peduncles, branches and pedicels glabrous or very sparingly puberulous, bracts and 2 bracteoles at base of calyx narrowly subulate, puberulous. *Calyx* 4 mm. long, puberulous, campanulate, base slightly gibbous, teeth acute subequal, upper pair wider than the three lanceolate lowest. *Corolla* white, petals with claws as long as calyx-tube, standard orbicular, emarginate, reflexed. *Stamens* usually 10, in one bundle slit along top. *Ovary* long-stipitate, glabrous, style subulate ; ovule usually solitary. *Pod* thinly coriaceous, pale straw-coloured, finely uniformly reticulated throughout, 1-seeded. *Seed* markedly reniform, 1·25 cm. long, 5 mm. wide, 1·2 mm. thick.

MALAYA : Borneo, near Kuching, Haviland 2889 ! Kalong, Haviland 2890 !

12. *DALBERGIA DYERIANA* Prain. A large climber, with slender, blackish, glabrous branches, branchlets occasionally hooked. *Leaves* 8–12 cm. long, leaflets 11–15, obovate-oblong, base cuneate, apex rounded retuse, thinly coriaceous, finely closely reticulate, sparsely adpressed-pubescent beneath, 2·5–3 cm. long, 1–1·25 cm. wide, rachis 7–9 cm. long and petiolules 2·5 mm. long glabrous or sparsely adpressed-pubescent. *Flowers* white, in lax few-flowered axillary panicles 5 cm. long, 3 cm. wide, rachis, branches and pedicels 3 mm. long puberulous. *Calyx* puberulous, campanulate, teeth triangular, obtuse, shorter than tube except the lowest subacute almost as long as tube. *Petals* with claws as long as calyx-tube. *Stamens* 9, monadelphous. *Ovary* stipitate, glabrous except the puberulous stipe ; ovules 2–3. *Pod* 1–2-seeded, thinly coriaceous, linear-oblong, 6·5 cm. long when 1-seeded 9 cm.

long when 2-seeded, 1.5 cm. wide, distinctly reticulated opposite the seeds.

CHINA: Hupeh, *Henry* 3437! 4132! 4138! 4561! Szechuen; Ky-min-se, *Farges* 1076! Yunnan; Mengtze, *Henry* 10503!

Farges gives the Chinese name as "Ta-kang-kin-ten."

13. *DALBERGIA CULTRATA* *Grah. in Wall. Cat.* 5861 (1832); *Benth. Journ. Linn. Soc. iv. Suppl.* 39 (1860); *Bak. in Hook. f. Flor. Brit. Ind. ii.* 233 (1876); *Kurz, For. Flor. Brit. Burma i.* 342 (1877). *D. zeylanica* *Wall. Cat.* 5847 B (1832), *nec Roxburgh.*

BURMA: Pegu, *Kurz* 1787! 2609! *Wallich!* *McClelland!* *Brandis!* Shan Hills, *Collett* 406! *King's Collector!* *Prazer!* Tenasserim, *Gallatly!* Troglä, near the hills, *Wallich* 5847 B! SIAM: Radboerie, *Teymann* 6027!

2. *Sissoë unguiculatæ.* Standard with a long claw.

14. *DALBERGIA HAVILANDI* *Prain.* A small tree with blackish, rugose, rusty-puberulous, thickish branchlets. *Leaves* 7-10 cm. long, leaflets 1-3, when three the two lateral subopposed, ovate, obtuse or subacute, base truncate, firmly coriaceous, pubescent especially on the nerves above, velvety beneath, 5-8 cm. long, 2.5-4 cm. wide, secondary nerves 4-5 pairs, much curved forwards distinct beneath; rachis 1.25-2.5 cm. long, densely velvety as are the petiolules 3.5 mm. long. *Flowers* in short, clustered racemes 1.25-2.5 cm. long, springing from tufts of triangular, rusty-velvety bracts in axils of old leaves, lowest pedicels longest, slender, 5 mm. long, tawny-pubescent as are the peduncles; bracts at base of pedicels solitary, ovate-lanceolate, 1.5 mm. long, persistent, the bracteoles below the calyx solitary, subulate, very small. *Calyx* campanulate, tawny-tomentose, 3.5 mm. long, teeth acute, half as long as tube. *Corolla* white, claws of petals as long as calyx-tube. *Stamens* 9, monadelphous, slit along upper side or occasionally (*fide* Haviland) in 2 bundles of 5 and 4 respectively. *Ovary* densely pubescent as is its stipe; ovules 2. *Pod* not seen.

BORNEO: Sarawak, near Kuching, *Haviland* 2894! 2895!

15. *DALBERGIA HULLETTII* *Prain, Journ. As. Soc. Beng. lxvi.* 2: 119 (1897).

SINGAPORE: *Hullett* 626!

16. *DALBERGIA ROSTRATA* *Grah. in Wall. Cat.* 5867 (1832). *D. Sissoo* *Miq. Flor. Ind. Bat. i.* 128 (1855) *nec Roxb.* *D. pseudo-Sissoo* *Miq. Flor. Ind. Bat. i.* 128 (1855); *Prain, Journ. As. Soc. Beng. lxvi.* 2: 118 (1897). *D. Championii* *Thwaites, Enum. Pl. Zeylan.* 95 (1860); *Benth., Journ. Linn. Soc. iv. Suppl.* 39 (1860); *Bak. in Hook. f. Flor. Brit. Ind. ii.* 231 (1876); *Trimen, Handbook of Ceylon Flora ii.* 88 (1894).

D. nitida Zipp. Mss. in Herb. Lugd.-Bat. *Endospermum zeylanicum* Champ. Mss. in Herb. Peradeniya.

S. INDIA: Tinnivelly, at foot of Ghauts on banks of the river Tambraparni, *Beddome* 2424! CEYLON: moist regions, 2000–4000 ft., *Thwaites* 761! JAVA: *Blume*! *Zippel*! *Hasskarl*! BORNEO: Sarawak, Gunong Woh, *Beccari* 2845! Igau, *Beccari* 3906! 3908! Sungei Unpanang, *Beccari* 3379! Singkawang, *Teysmann* 7875! Kuching, *Haviland* 2111! CELEBES: S.-E. Peninsula, at Lepo-Lepo, near Kandari, *Beccari*! MALAY PENINSULA: Perak; Larut, *Kunstler* 3177! 3340! 3579! 4964! 6565! *Scortechini* 1348! Wray 2098! 2965! Penang; Govt. Hill, *Curtis*! Singapore; Bukit Mandai and elsewhere, *Hullett*! *Ridley*!

17. *DALBERGIA KINGIANA* Prain, *Journ. As. Soc. Beng.* lxvii. 2. 289 (1898).

BURMA: Kachin Hills, *Shaik Mokim*!

18. *DALBERGIA HENRYANA* Prain. A large woody climber with rusty-pubescent young branches. *Leaves* 12 cm. long, leaflets 4–5, ovate, acute, base cuneate or rounded, coriaceous, glabrous above, softly densely pubescent beneath, terminal the largest 7 cm. long, 3.5 cm. wide; rachis 6 cm. and petiolules 3.5 mm. rusty-puberulous. *Flowers* white, in loose panicles 10 cm. long, with rusty-pubescent main-rachis and branches 3 cm. long; pedicels rusty, 3 mm. long; bracts and bracteoles small, ovate, rusty-pubescent. *Calyx* campanulate, densely rusty-pubescent, 4.5 mm. long, teeth subequal triangular. *Petals* with claws as long as calyx. *Stamens* 9, monadelphous. *Ovary* pubescent, with long pubescent stipe; ovules usually 2. *Pod* not seen.

CHINA: Yunnan, at Mengtze, *Henry* 11248!

19. *DALBERGIA BENTHAMII* Prain, *Journ. As. Soc. Beng.* lxvii. 2. 289 (1898). A woody climber, branches black, glabrous. *Leaves* 12–14 cm. long; leaflets 5–7, ovate or oblong-elliptic, narrowed to the obtuse or retuse apex, base cuneate or rounded, coriaceous, glabrous above, glaucescent and finely adpressed-puberulous beneath, terminal the largest 5 cm. long, 2.5 cm. wide; rachis 8 cm. long and petiolules 4 mm. long glabrous. *Flowers* in short, axillary, rusty-pubescent panicles 3.5 cm. long, branches 1 cm. long, pedicels 3 mm. long; bracts and bracteoles ovate, deciduous, rusty-pubescent. *Calyx* campanulate, densely rusty-tomentose, 4 mm. long, the 3 lower teeth narrow-ovate, rather longer than the two wider upper. *Petals* with claws as long as calyx. *Stamens* 9, monadelphous. *Ovary* glabrous, stipitate; ovules usually 3. *Pod* glabrous, long stipitate, thinly coriaceous, ligulate, 1–2-seeded, 5–7 cm. long, 2 cm. wide, faintly reticulate opposite the compressed, reniform seed. *D. rubiginosa* Benth., *Flor. Hongkong.* 93 (1861) *non* Roeb.

CHINA: Hongkong, *Hance* 1053! *Wilford*! *Wright* 140! *Ferd!* *Seemann*! *Bodinier*! *Urquhart*! *Harland*!

20. *DALBERGIA GARDNERIANA* Benth., *Journ. Linn. Soc. iv. Suppl.* 42 (1860); Prain, *Journ. As. Soc. Beng. lxi. 2. 444* (1897). *D. congesta* Bak. in Hook. f. *Flor. Brit. Ind. ii. 232* (1876) *partim, nec Benth.*

S. INDIA: Nilgiris, *Gardner!* Metz (Hohenacker 1591)! *Wight* 824! *G. Thomson!* *Clarke* 11129! *Gamble* 13176! 14501! *Perrottet* 469!

21. *DALBERGIA RUBIGINOSA* Roxb. *Coromand. Pl. ii. 9, t. 115* (1798); *Hort. Beng. 98* (1814); *DC. Prodr. ii. 416* (1825); *W. & A. Prodr. i. 265* (1834); *Benth., Journ. Linn. Soc. iv. Suppl. 43* (excl. ref. China) (1860); *Bak. in Hook. f. Flor. Brit. Ind. ii. 232* (1876); *Prain, Journ. As. Soc. Beng. lxi. 2. 443* (1897).

W. INDIA: Concan, *Stocks!* *Wight* 823! 924! Canara, *Talbot* 70! 1182! 1867! 3594!

22. *DALBERGIA CONGESTA* Grah. in *Wall. Cat. 5872* (1832); *W. & A. Prodr. i. 265* (1834); *Benth. in Journ. Linn. Soc. iv. Suppl. 43* (1860); *Bak. in Hook. f. Flor. Brit. Ind. ii. 232* (excl. syn. *D. Gardneriana*) (1876).

S. INDIA: Coonoor, 6000 ft. *Brandis!* *Gamble* 11694! *Prain!* UPPER BURMA: Chin Hills, *Prazer!*

23. *DALBERGIA DENSE* Benth., *Lond. Journ. Bot. ii. 217* (1843); *Journ. Linn. Soc. iv. Suppl. 43* (1860); *Flor. Austral. ii. 271* (1864).

MALAY ARCHIPELAGO: Amboina, *Teysmann* 5120! Key Islands, *Keitel* at Tual, *Beccari!* New Guinea; without locality, *Hinds!* Island of Jobie, *Barclay!* Kaiser Wilhelmsland, *Hollrung* 84! 174! 477! AUSTRALIA: Queensland, *von Mueller!* *Bailey!* Possession Island, *R. Brown!* Prince of Wales Island, *R. Brown!* Torres Straits, *Moseley!* Albany Island, *Hill!*

24. *DALBERGIA BURMANICA* Prain, *Journ. As. Soc. Beng. lxi. 2. 448* (1897).

BURMA: Ruby Mines District, *King's Collectors!* Chin Hills, *C. R. Dun* 50!

25. *DALBERGIA JAHERII* Buerck Mss. in *Herb. Bogor.* A large shrubby climber with glabrous branches. *Leaves* 5–8 cm. long; leaflets 15–23, ovate-oblong, base faintly obliquely cuneate, apex rounded slightly emarginate, chartaceous, green above slightly glaucescent beneath, finely sparsely adpressed-pubescent on both surfaces, 3 cm. long, 1.25 cm. wide, rachis 8–10 cm. long, and petiolules 4 mm. long glabrous. *Flowers* in congested axillary panicles 3 cm. long, 2 cm. wide, rachis and branches puberulous, pedicels 3 mm. long, puberulous; bracts and 2 bracteoles under the calyx ovate, puberulous. *Calyx* campanulate, glabrescent, 4 mm. long, teeth short, triangular, obtuse. *Corolla* white, 8 mm. long, claws of petals as long as calyx-tube, standard ovate, reflexed. *Stamens* 10, monadelphous, sheath slit along upper side.

Ovary glabrous, long-stalked, style subulate; ovules 2. *Pod* narrow-oblong, rather firmly coriaceous, with rounded apiculate tip, distinctly stipitate, usually 2-seeded, 5–6 cm. long, 1.25 cm. wide.

MALAYA: Key Islands, Warburg 20312! Key Toewal, Jaher! Also cult. in Hort. Bogor, introduced from Key Toewal!

Most nearly related to *D. polyphylla* and *D. tamarindifolia* but very distinct from both.

26. *DALBERGIA POLYPHYLLA* Benth. *Journ. Linn. Soc. iv. Suppl. 44* *excluding the Bornean plant* (1860). *D. polyphylla* Benth. *Pl. Jungh. i. 256, in part; the Philippine plant only* (1854).

PHILIPPINES: Luzon, Cuming 1164! Vidal 2589!

Specimens of this in Herb. Berol. and Herb. De Candolle have been kindly lent for study; the writer has also seen those at Kew and the British Museum. The species is a very distinct one, nearest to *D. tamarindifolia*. The two plants referred to the same species at different times by Mr. Benthham are both *Triptolemez*, one is *D. Millettii* Benth., a Chinese species, the other is *D. phyllanthoides* Bl., a Malayan one.

Vidal gives the vernacular name as "Payasi."

27. *DALBERGIA ACACIÆFOLIA* Dalz. in *Kew Journ. ii. 37* (1850). *D. tamarindifolia* VAR. *acaciæfolia* Bak. in *Hook. f. Flor. Brit. Ind. ii. 235* (1876).

WESTERN INDIA: Concan, Law! N. Canara, Talbot 3588! Tinnivelly Hills, Naidoo!

A very distinct species, differing from *D. tamarindifolia*, to which it is most closely allied, in its foliage, the leaflets being glaucous beneath; and in its larger, firmly coriaceous pod.

28. *DALBERGIA MALABARICA* Prain. A shrubby climber with densely rusty-pubescent young branches. *Leaves* 9–10 cm. long; leaflets 21–31, thinly pubescent above, densely tomentose beneath, crowded, elliptic-oblong, hardly or not oblique at the base, 1.25 cm. long, 6–7 mm. wide, moderately firm; rachis 8–9 cm. long densely pubescent, petiolules very short and lanceolate stipules densely rusty-pubescent. *Flowers* with the leaves, in congested, sessile, axillary corymbs 1.5 cm. long, 6 mm. wide; peduncles densely pubescent, pedicels glabrous; bracts triangular-ovate, persistent, and bracteoles 2 below calyx lanceolate, persistent, pubescent. *Calyx* campanulate, glabrous except on the margins of the teeth, 4 mm. long, teeth nearly as long as tube, the two upper connate obtuse, the others lanceolate acute. *Corolla* white, 8 mm. long, claws of petals as long as calyx-tube, standard ovate, entire, reflexed. *Stamens* 9, monadelphous. *Ovary* glabrous except along the upper suture, stipe distinct pubescent; style filiform; ovules 2. *Pod* ovate-oblong, very thinly coriaceous, glabrous, long stipitate, 3 cm.

long, 1·5 cm. wide, distinctly reticulately veined especially opposite the seed. *D. tamarindifolia* var. *pubescens* Bak. in Hook. f. *Flor. Brit. Ind.* ii. 235 (1876).

WESTERN INDIA : Concan, *Stocks* ! Canara, *Talbot* 408 ! 3665 ! Quilon, *Wight* ! S. Tinnivelly, *Beddome* !

Though placed with *D. tamarindifolia* by Mr. Baker this is very distinct by its leaflets, which are hardly if at all oblique at the base, and by its different pods.

29. *DALBERGIA TAMARINDIFOLIA* Roxb. *Hort. Beng.* 53 (1814) ; *Flor. Ind.* iii. 233 (in part) (1832) ; *Wall. Cat.* 5870 (1832) ; *Wight Icon.* t. 242 (excl. fruit) (1840) ; *Voigt, Hort. Suburb. Calcutt.* 241 (1845) ; *Miq. Flor. Ind. Bat.* i. 131 (1855) ; *Benth. Journ. Linn. Soc. iv. Suppl.* 44 (1860) ; Bak. in Hook. f. *Flor. Brit. Ind.* ii. 234 (1876) ; *Kurz, For. Flor. Brit. Burma* i. 348 (1877) ; *Prain, Journ. As. Soc. Beng.* lxvi. 2. 117 (1897). *D. rufa* Grah. in *Wall. Cat.* 5864 (1832). *D. multijuga* Grah. in *Wall. Cat.* 5865 (1832) ; *Zoll. et Mor. Verzeichn.* 2 (1845). *D. Blumei* Hassk. *Cat. Hort. Bogor.* 284 (1844) ; *Pl. Jav. Rar.* 400 (1848).

HIMALAYA : Nepal, *Wallich* ! Sikkim, *Hooker* ! *Lister* ! ASSAM : Brahmaputra Valley, *Watt* ! *Simons* ! *Peal* ! *Jenkins* ! *Mann* ! *Clarke* ! Silhet, *Gomez* ! CHITTAGONG : Kodala, *King's Collector* ! BURMA : Tenasserim, *Wallich* ! *Griffith* ! *Helper* ! *Falconer* ! ANDAMANS : S. Andaman, common ; Barren Island, *Prain* ! CHINA : Yunnan, *Taping Valley*, *J. Anderson* ! MALAYA : Langkawi, *Curtis* ! Perak, *Scortechini* ! *Wray* ! *Kunstler* ! Penang, *Wallich* ! Malacca, *Maingay* ! *Derry* ! Sumatra, *Korthals* ! *Forbes* ! Java, *Horsfield* ! *Ploem* ! *Zollinger* ! Borneo, *Korthals* ! *Motley* 262 ! *Creagh* ! *Haviland* ! PHILIPPINES : Luzon, *Vidal* 250 !

The native name given for this by Hasskarl is Aroy Tjetjereha or "climbing Tamarind." In Hort. Bogor at present this name connotes *D. phyllanthoides* Bl., which is in cultivation there under the name *D. littoralis* Hassk.

3. *Sissoë unguiculatæ Pseudoselenolobiæ*.

30. *DALBERGIA CANDENATENSIS* Prain. *Cassia candenatensis* Dennst. *Schl. zum Hort. Malabar.* 12 (1818). *Dalbergia torta* Grah. in *Wall. Cat.* 5873 (1832) ; *Prain, Journ. As. Soc. Beng.* lxvi. 2. 120 (1897). *D. monosperma* Dalz. *Hook. Journ. Bot.* ii. 36 (1850) ; *Miq. Flor. Ind. Bat.* i. 132 (1855) ; *Benth. Journ. Linn. Soc. iv. Suppl.* 48 (1860) ; *Dalz. & Gibs. Bomb. Flor.* 78 (1861) ; Bak. in Hook. f. *Flor. Brit. Ind.* ii. 337 (1876) ; *Talbot, Bombay List* 75 (1894). *Drepanocarpus monospermus* *Kurz, For. Flor. Brit. Burm.* i. 337 (1877).—*Karin Tagera Rheed*, *Hort. Malabar.* vi. 25.

W. INDIA : Concan, *Stocks* ! *Law* ! Malabar, *Rheed* (Ic.) ! Quilon, *Wight* 820 ! CEYLON : Pandure, Trincomali and Kodiya, *Thwaites* ! *Trimen* ! BENGAL : Sundribuns, *Clarke* 33423 ! *Heinig* ! ANDAMANS :

Narcondam, *Prain* ! S. Andaman, very common, *King's Collectors* ! BURMA : Amherst, *Falconer* ! Kalian river, Martaban, *Wallich* ! Mergui, *Griffith* 1799 ! COCHIN-CHINA : between Saigon and Cholen, *Lefèvre* 132 ! Annam, Haton, *Godefroy* 753 ! Tonkin, *Balansa* 1202 ! MALAYA ; Langkawi, *Curtis* 2868 ! Penang, *Wallich* 5873 ! *Curtis* 220 ! Perak, coast, *Scortechini* 1099 ! *Wray* 2502 ! Malacca, at Tanjong Kling, *Ridley* 3312 ! Singapore, *Wallich* ! *Kurz* ! T. Anderson ! *Kunstler* 66 ! *Ridley* 5576 ! *Wichura* 656 ! Sumatra ; Indrapura, *Korthals* ! *Miller* 1778 ! Biliton, at Blimbong, *Teysmann* ! Borneo ; Sarawak, Matong, *Beccari* 2526 ! Igau, *Beccari* 3905 ! Bintulu, *Haviland* 2892 ! Celebes ; S.-E. Peninsula, Lepo-Lepo near Kandari, *Beccari* ! Moluccas ; Amboina, *Forster* ! Ceram Lant, *Forster* ! *Warburg* 20311 ! New Guinea ; *Forbes* ! PHILIPPINES : Luzon, Batangos, *Cuming* 1542 ! *Vidal* 2605 ! Manila, *Cuming* 1541 ! CHINA : Little Hongkong, *Forl* ! Hongkong, *Hance* ! POLYNESIA : Fiji, *Seemann* 128 ! Tonga Isds. at Vavau, *Croottz* 39 ! N. Caledonia, *Pancher* 44 ! *Deplanche* 336 ! *Veillard* 2927 ! AUSTRALIA : Cape York, *Damel* ! Rockingham Bay, *Dallachy* ! Port Darwin, *Schultz* 744 !

Miquel reports the species also from Bangka ; it is curious that it has never apparently been collected in the Sunda Archipelago or in Java. The only specimens from Java that I have seen are from plants cultivated in the Buitenzorg Garden Hort. Bogor. nn. 854 ! 2692 !

Godefroy gives the Annamese name as " Cayme mûk " and the Cambodian as " Baï tuk."

31. DALBERGIA MENOEIDES *Prain*, *Journ. As. Soc. Beng.* lxvi. 2. 120 (1897) and 453 (1897).

MALAYA : Perak, *Scortechini* 1392 !

II. DALBERGARIA Benth.

4. *Dalbergariaeæ*.

32. DALBERGIA GLOMERIFLORA *Kurz*, *Journ. As. Soc. Beng.* xlii. 2. 70 (1873) ; *Bak. in Hook. f. Flor. Brit. Ind.* ii. 236 (1876) ; *Kurz, For. Flor. Brit. Burma* i. 345 (1877).

BURMA : Prome, *Kurz* 2611 !

33. DALBERGIA CANA *Grah. in Wall. Cat.* 5859 (1832) ; *Kurz in Journ. As. Soc. Beny.* xlii. 2. 70 (1873) *Bak. in Hook. f. Flor. Brit. Ind.* ii. 237 (1876) ; *Kurz, For. Flor. Brit. Burma* i. 344 (1877) ; *Prain, Journ. As. Soc. Beng.* lxvi. 2. 450 (1897). *D. purpurea* *Wall. Cat.* 5869 (1832) ; *Benth. in Journ. Linn. Soc. iv. Suppl.* 46 partly (1860) ; *Bak. in Hook. f. Flor. Brit. Ind.* ii. 235 partly (1876).

BURMA : Tenasserim, *Wallich* 5859 ! 5869 ! Pegu, *Brandis* ! *Kurz* 1779 ! 2601

34. DALBERGIA KURZII *Prain*, *Journ. As. Soc. Beng.* lxvi. 2. 450 (1897). *D. purpurea* *Kurz, Journ. As. Soc. Beng.* xlv. 2. 279 excl. cit.

Wall. Cat. 5869 (1875); For. Flor. Brit. Burma i. 344 (1877); not of Wall.

BURMA: Pegu, McClelland 8! Brandis 1170! Kurz 1780! 1783! 2603! 2603! Kalay Hills, Prazer! Shan Hills, Alpin! Ruby Mines Dist., King's Collector!

35. *DALBERGIA PANICULATA* Roxb. Cor. Pl. ii. 8, t. 114 (1798); Hort. Beng. 53 (1814); DC. Prodr. ii. 417 (1825); Spreng. Syst. iii. 193 (1826); Roxb. Flor. Ind. iii. 227 (1832); Wall. Cat. 5848 partly (1832); W. & A. Prodr. i. 265 (1834); Grah., Cat. Bomb. Pl. 55 (1839); Benth., Journ. Linn. Soc. iv. Suppl. 45 (1860); Dalz. & Gibs. Bomb. Flor. 78 (1861); Bedd. Flor. Sylvat. t. 88 (1869); Brandis, For. Flor. 151 (1874); Bak. in Hook. f. Flor. Brit. Ind. ii. 236 (1876); Talbot, Bombay List 75 (1894); Prain, Journ. As. Soc. Beng. lxvi. 2. 449 (1897). *D. nigrescens* Kurz, Pegu Rep. App. A 48 (1875); For. Flor. Brit. Burma i. 346 (1877).

S. INDIA: Circars, Roxburgh! Mysore, Heyne! G. Thomson! Columala, Wight! Cuddapah, Naidoo! Gamble 10867! Travancore, Lawson! W. INDIA: Concan, Gibson! Stocks! Canara, Talbot! BURMA: Pegu, Eyre! Kurz 2618! Upper Burma, Griffith 1810! King's Collectors! J. Anderson! Shan Hills, King's Collectors!

36. *DALBERGIA SERICEA* G. Don, Gen. Syst. ii. 375 (1832). *D. robusta* Wall. Cat. 5849 A (1832); not of Roxb. *D. hircina* Wall. Cat. 5871 B (1832); Benth. Journ. Linn. Soc. iv. Suppl. 46 (1860); Bak. in Hook. f. Flor. Brit. Ind. ii. 236 (1876); Gamble, Darjeeling List 29 (1896); Prain, Journ. As. Soc. Beng. lxvi. 2. 449 (1897); not of Ham. *D. stenocarpa* Kurz, Journ. As. Soc. Beng. xlv. 2. 205 (1875); Bak. in Hook. f. Flor. Brit. Ind. ii. 238 (1876). *D. emarginata* Royle Mss. in Herb. Kew; not of Roxb. *D. assamica* Benth. Journ. Linn. Soc. iv. Suppl. 45 in part (as to the Subsewalik locality only) (1860); Bak. in Hook. f. Flor. Brit. Ind. ii. 235 partly (1876).

HIMALAYA: Garhwal, King! Duthie! Kamaon, Strachey & Winterbottom 3! T. Thomson! Wallich! Royle! King! Duthie! MacKinnon! Nepal, Wallich! Hamilton! Sikkim, Gamble! Lister! Gammie! Clarke! Prain! Bootan, Griffith 1812! Gamble! Alipur Duars, Heawood!

Two names were indirectly made available for this very distinct species by Dr. Wallich. These are *D. robusta* Wall., given by that botanist under the mistaken belief that this was the same as Roxburgh's *D. robusta* which is a *Derris*, and *D. hircina* used under the mistaken impression that this is what Hamilton intended by *D. hircina*. Though aware that this also was a mistake, Mr. Benthham has chosen the latter as the preferable name. Fortunately, though this was not known to Mr. Benthham, there is another name, *D. sericea* G. Don, which dates from the same year and has the advantage of being accompanied by a description; it therefore supersedes both the others.

Mr. Baker has apparently seen an example of Wall. Cat. 5849 A which is =

D. lanceolaria Linn. f.; the writer has not seen one. In any case Wall. Cat. 5 A at the Linnean Society's rooms (Wallich's type Herbarium) is *D. sericea*.

Dalbergia hircina Ham., as written up by Hamilton himself (in Herb. Brit. Museum), on two specimens collected at Darhora 12th Apl., 1811, and at Sukhiya 23rd Aug., 1809, is *D. lanceolaria*. The type of *D. sericea* G. Don, as shown by a specimen from Herb. Lambert named by G. Don himself, and now in the British Museum collection, was also collected by Hamilton. On this Hamilton has noted "Dalbergia? A tree; Cheria ghaut Hills 31-3-1802." It is this that has, in Wall. Cat. 5871 B, been erroneously written up by Wallich as *D. hircina*.

37. *DALBERGIA LANCEOLARIA* Linn. f. *Suppl.* 316 (1781); *DC. Prodr.* ii. 417 (1825); *Benth., Journ. Linn. Soc.* iv. *Suppl.* 45 (1860); *Dalz. & Gibs., Bomb. Flor.* 78 (1861); *Brandis, For. Flor.* 151 (1874); *Bak. in Hook. f. Flor. Brit. Ind.* ii. 235 (1876); *Talbot, Bombay List* 74 (1894). *D. frondosa* Roxb. *Hort. Beng.* 53 (1814); *DC. Prodr.* ii. 417 (1825); *Roxb. Flor. Ind.* iii. 226 (1832); *Wall. Cat.* 5855 (1832); *W. & A. Prodr.* i. 266 mainly (1834); *Grah., Pl. Bombay* 55 (1839); *Wight Icones* t. 266 (1840); *Voigt, Hort. Suburb. Calcutt.* 241 (1845); *Bedd., Flor. Sylvat.* t. 88 (1869). *D. zeylanica* Roxb. *Hort. Beng.* 53 (1814); *Flor. Ind.* iii. 228 (1832); *Wall. Cat.* 5847 A (1832); *Voigt, Hort. Suburb. Calcutt.* 241 (1845). *D. arborea* Heyne in *Roth. Nov. Sp.* 330 (1821); *DC. Prodr.* ii. 417 (1825). *D. hircina* Ham. in *Wall. Cat.* 5871 A (1832).

N. INDIA: Hardwar, Hamilton! King! T. Thomson! Darhora, Hamilton! Sukhiya, Hamilton! Rajputana, Abu, King! Ajmir, Jacquemont! Moir! Brandis! C. India; Jerdon! Chota Nagpur, Gamble! Haines! Campbell! Clarke! Wood! Prain! Behar, Hooker! Kurz! W. INDIA: Concan, Stocks! Law! Canara, Talbot! Belgaum, Ritchie! S. INDIA: Madras, Heyne! Roxburgh! Mysore, G. Thomson! Vellore, Gamble! Kurnool, Gamble! Tellicherry, Metz (Hohenacker 723)! Wight 927! Cottulam, Leschenault 191! Shevarois, Perrottet! CEYLON: Thwaites 1496! CULTIVATED at Bourbon, Richard!

Letter A of Wallich's *Dalbergia robusta*, reduced to this by Mr. Baker, is *D. sericea* G. Don (= *D. hircina* Benth. and Bak. not of Ham.). Wight and Arnott have mainly *D. lanceolaria* under *D. frondosa*, but one of their quoted sheets, Wight n. 928, is *D. paniculata*. Leschenault in Herb. Paris gives the native name of this as "Toda cotty morum."

38. *DALBERGIA ASSAMICA* Benth. *Pl. Junghuhn.* i. 255 (1854); *Journ. Linn. Soc.* iv. *Suppl.* 45 partly, the Assam locality only (1860); *Bak. in Hook. f. Flor. Brit. Ind.* ii. 235 partly, the Assam locality only (1876); *Prain, Journ. As. Soc. Beng.* lxvi. 2. 449 (1897). *D. lanceolaria* Gamble, *Darjeeling List* 29 (1896) not of Linn. f.

SIKKIM: Narchu Valley Prain! Prain's Collector! ASSAM: Brahmaputra Valley, Griffith K.D. 1803! Hooker & Thomson! Masters! Peal! Watt! Jenkins 54!

This is a fine tree, known in Assam as "Medeloa." The Subsiwalik specimens collected by Edgeworth and included in this species by Bentham prove, on examination, to belong to *D. sericea* G. Don. (= *D. robusta* Wall. not Roxb. = *D. hircina* Benth. not Ham.).

39. *DALBERGIA HUPEANA* Hance, *Journ. Bot.* xx. 5 (1882); *Forbes & Hemsl., Journ. Linn. Soc.* xxiii. 198 (1887).

CHINA: Ichang; *Walters! Henry 3670! 4558! 3112! 4932! Ningpo; Oldham! Cooper! Faber! Kwangtung; Sampson! Ford! Carles 556! Nant'o, Carles 287! E. Szechuen; Farges 1213! Yang-tze-kiang, Faber!*

This Farges terms "Tan-mou-chou," the wood being "Tchan-Keon." Cooper says "Paitan" is the local, "white Chandan" the classical name. Henry, on n. 3670 at Kew, calls it the Tân tree.

40. *DALBERGIA WATTII* Clarke, *Journ. Linn. Soc.* xxv. 17, t. 5 (1889); *Prain, Journ. As. Soc. Beng.* lxvi. 2. 451 (1897).

MANIPUR: Metaiphum, 5000 ft., *Watt 6830! Mayung, 3500 ft., Clarke 42034!*

41. *DALBERGIA OLIVERI* Gamble ex Prain in *Journ. As. Soc. Beng.* lxvi. 2. 451 (1897). *D. paniculata* Kurz, *For. Flor. Brit. Burm.* i. 345 (1877) not of Roxb. *D. purpurea* Bak. in *Hook. f. Flor. Brit. Ind.* ii. 235 partly and as to Pegu specimens only (1876); *Prain, Journ. As. Soc. Beng.* lxvi. 2. 449 (1897).

BURMA: Pegu, *Kurz 1781! 2604! Wuntho and Bhamo, J. W. Oliver! Collectors of Forest Dept.!*

The recent receipt of fruiting specimens and oldish leaves of "Tamalan" (*D. Oliveri* Gamble) shows that this tree is the same as the "Tabou-ben" of Kurz's Flora (*D. paniculata* Kurz, not of Roxb.) and further settles finally a very troublesome question that had arisen regarding the incidence of the name *D. purpurea*.

In the Linnean Society's Herbarium (Wallich's type herbarium) and in all the other herbaria seen by me *D. purpurea* Wall. is = *D. cana* Grah., except at Kew where there is mixed with *D. cana* some *D. volubilis*. Bentham's *D. purpurea*, which is based on that material, is thus a mixture of *D. cana* and *D. volubilis*, while to these species Mr. Baker, in the F.B.I., has added a third in the shape of *D. paniculata* Kurz, non Roxb. The writer's *D. purpurea*, in this *Journal* (lxvi. 2. 449) rejected both *D. purpurea* Wall. and *D. volubilis*, and is restricted to Kurz's plant, for which in any case therefore a new name would have had to be provided had this not already fortunately been done by Mr. Gamble.

42. *DALBERGIA PRAZERI* Prain, *Journ. As. Soc. Beng.* lxvi. 2. 452 (1897).

BURMA: Shan Hills at Koni, *Prazer! SIAM: Teysmann 52!*

Very closely related to *D. Oliveri*, "Tamalan" or "Tabon-ben" and to *D. stipulacea* "Donk-ta-loung-nway," having the pods of the former but in foliage more resembling the latter.

43. *DALBERGIA HEMSLEYI* Prain, *Journ. As. Soc. Beng.* lxvi. 2. 450 (1897).

BURMA: Shan Hills, Collett! Prazer! King's Collector!

44. *DALBERGIA BALANSE* Prain. A tree 20–30 feet high. *Leaves* 13–18 cm. long, leaflets 13–15, ovate-oblong, obtuse or retuse, persistently puberulous beneath, chartaceous, finely reticulately veined, 3–4 cm. long, 2 cm. wide, rachis 10–15 cm. and petiolules 4 mm. long puberulous; stipules lanceolate. *Flowers* in lax axillary panicles 8–10 cm. long, 5 cm. wide, with glabrescent peduncles and slender puberulous pedicels, bracts ovate-lanceolate and 2 lanceolate obtuse bracteoles under the calyx very caducous. *Calyx* campanulate, the upper teeth subconnate obtuse and lateral subacute half as long as tube, lowest lanceolate as long as tube. *Corolla* white, standard orbicular 2-callose at base. *Stamens* in 2 phalanges of 5 each. *Ovary* densely pubescent; ovules usually 3. *Pod* long-stipitate, tapering to both ends, usually 1-, rarely 2–3-seeded, coriaceous, reticulated opposite the seed, 8–12 cm. long, 3.5 cm. wide. *Seeds* subreniform, compressed. *D. lanceolaria* Hemsl., *Journ. Linn. Soc.* xxiii. 193 (1887); *Drake del Castillo*, *Journ. de Bot.* v. 214 (1891) not of Linn. f.

CHINA: Kwangtung, Sampson! Ford! Kiu-Kiang, Shearer! Millett!

TONKIN: Mt. Bavi, Balansa 2289!

45. *DALBERGIA VOLUBILIS* Roxb. *Cor. Pl.* ii. 48, t. 191 (1798); *Hort. Beng.* 98 (1814); *DC. Prodr.* ii. 417 (1825); *Spreng. Syst.* iii. 193 (1826); *Roxb. Flor. Ind.* iii. 231 (1832); *Wall. Cat.* 5874 (1832); *W. & A. Prodr.* i. 265 (1834); *Grah., Cat. Bomb. Pl.* 55 (1839); *Benth. Journ. Linn. Soc.* iv. *Suppl.* 46 (1860); *Dalz. & Gibs. Bomb. Flor.* 78 (1861); *Brandis, For. Flor.* 152 (1874); *Bak. in Hook. f. Flor. Brit. Ind.* ii. 235 (1876); *Kurz, For. Flor. Brit. Burm.* i. 346 (1877); *Talbot, Bombay List* 75 (1894); *Prain, Journ. As. Soc. Beng.* lxvi. 2. 114 (1897). *D. confertiflora* Benth., *Journ. Linn. Soc.* iv. *Suppl.* 41 partly, both the Oudh and the Concan plants (1860) not of Benth. in *Pl. Junghuhn.*; *Bak. in Hook. f. Flor. Brit. Ind.* ii. 233 partly (1876); *Talbot, Bombay List* 75 (1894). *D. foliacea* Wall. *Cat.* 5856 partly (1832). *D. purpurea* Benth., *Journ. Linn. Soc.* iv. *Suppl.* 46 partly (1860); *Bak. in Flor. Brit. Ind.* ii. 235 partly (1876) not of Wallich. *D. stipulacea* Gamble, *Darjeeling List* 29 partly (1896) not of Roxb.

N. INDIA: Oudh, Wallich! Duthie! W. Duars, Gamble 6683! Terai, Anderson! Clarke! Kamaon Bhabar, 1000 ft., Strachey and Winterbottom 2! Behar, Kurz! Campbell! Ball! Chota Nagpur, T. Anderson! Thomson! Wood! Clarke! C. INDIA: Sagor, Jerdon! C. Provinces, Duthie! W. INDIA: N. Canara, Talbot! Concan, Stocks! Malabar, Stocks! S. Canara, Metz (Hohenacker 561)! S. INDIA: Circars,

Roxburgh! Bolimpati, *Wight!* Travancore, *Lawson!* Kurnool, *Gamble!* Ganjam, *Gamble!* ASSAM: Goalpara, *Clarke!* Garo Hills, *Watt!* CHITTAGONG: Thanacheri, etc. *Hooker & Thomson!* *Gamble!* *Lister!* *King's Collector!* BURMA: Chin Hills, *Prazer!* *King's Collector!* Kachin Hills, *Prain's Collector!* Bhamo, *J. Anderson!* Shway Yoe, *J. Anderson!* Pegu, *Brandis!* *Kurz!* Shan Hills, *Collett!* *Prazer!* *King's Collectors!* Tenasserim, *Wallich* 5856 B! *Oleghorn!* *Gallatly!* *Helfer* 1805! ANDAMANS: S. Andaman, very common, *King's Collectors!*

46. *DALBERGIA FERRUGINEA* *Roxb. Hort. Beng.* 98 (1814); *Flor. Ind.* iii. 223 (1832); *Miq. Flor. Ind. Bat. i.* 1. 133 (1855). *D. luzonensis* *Vog. Nov. Act. Nat. Cur. xix. Suppl. i.* 33 (1843); *Benth, Journ. Linn. Soc. iv. Suppl.* 48 (1860). *D. penduliflora* *Blume ex Miq. loc. cit.* (1855). *D. stipulacea* *Benth. loc. cit., partly* (1860) *not of Roxb.*

MALAYA: Brit. N. Borneo, Bangi island at Pankalan, *Fraser* 274! Moluccas, at Tidore, *Christian Smith!* *Teysmann* 5186! Buru, *Buitenzorg Collectors!* Ceram, *Teysmann* 5043! *Foerster!* Ceram Laut, *Warburg* 20309! NEW GUINEA; Dutch N. G. at Sigar, near the coast, *Warburg* 20313! Andai, *Beccari* 554! 693! PHILIPPINES: Manilla, *Meyen!* Sawar, *F. Jagor* 945! Luzon, *Vidal* 2598! Panay, *Vidal* 2606!

47. *DALBERGIA STIPULACEA* *Roxb., Hort. Beng.* 53 (1814); *Flor. Ind.* iii. 233 (1832); *Wight, Icones t.* 453 (1840); *Voigt, Hort. Suburb. Calcutt.* 241 (1845); *Miq. Flor. Ind. Bat. i.* 1. 133 (1855); *Benth., Journ. Linn. Soc. iv. Suppl.* 47 (1860); *Bak. in Hook. f. Flor. Brit. Ind. ii.* 237 *excluding the syns.* *D. ferruginea* and *D. rostrata* (1876); *Kurz, For. Flor. Brit. Burm. i.* 346 (1877); *Gamble, Darjeeling List* 29 (1896); *Prain, Journ. As. Soc. Beng. lxvi.* 2. 451 (1897). *D. tingens* *Ham. in Wall. Cat.* 5860 (1832). *D. cassioides* *Wall. Cat.* 5863 (1832). *D. livida* *Grah. in Wall. Cat.* 5866 (1832).

EASTERN HIMALAYA: Sikkim, lower Hills and Terai, *Hooker!* *Kurz!* *Anderson!* *Clarke!* *Gamble!* *King!* *Prain!* Bootan and Duars, *Gamble!* *Lister!* *Haines!* ASSAM: Brahmaputra Valley, *Hamilton!* *Jenkins!* *Simons!* *Clarke!* *Mann!* *Fisher!* *Peal!* Naga Hills, *King's Collector!* *Watt!* *Prazer!* *Prain's Collector!* Garo Hills, *Clarke!* Khasia Hills; *Hooker & Thomson!* *Clarke!* Manipur, *Watt!* Silhet, *deSilva!* *Clarke!* CHITTAGONG: Kodala, *King's Collector!* BURMA: Kachin Hills, *Prain's Collector!* Hukung, *Griffith!* Chin Hills, *Prazer!* Kalay Hills, *Prazer!* Shan Hills, *King's Collector!* Pegu, *McClelland!* *Kurz!* *Brandis!* Tenasserim, *Wallich!* *Gomez!* *Brandis!* *Helfer!* *Gallatly!* *Oleghorn!* *Falconer!*

This species does not, as Mr. Baker supposes, extend to Malaya. The reason for the belief was the tentative reduction to this species by Mr. Benthham of the very different *D. ferruginea* *Roxb.*, which was based on Moluccan specimens. *D. rostrata* *Grah.*, also reduced here, is the very different species described by Thwaites as

D. Championii and previously described by Miquel as *D. pseudo-Sissoo* and also as *D. Sissoo*.

III. TRIPTOLEMEA Benth.

5. *Triptolemeæ* varæ.

48. *DALBERGIA CONFERTIFLORA* Benth., *Pl. Junghuhn* i. 255 (1854); *Journ. Linn. Soc.* iv. *Suppl.* 41 (1860); *Bak. in Hook. f. Flor. Brit. Ind.* ii. 233 (1876); *Prain, Journ. As. Soc. Beng.* lxvi. 2. 114 (1897). *D. paniculata* Wall. *Cat.* 5848 partly (1832); *letters E.G.I.* *D. rubiginosa* Kurz, *For. Flor. Brit. Burma* i. 347 (1877) not of Roxb.

EASTERN HIMALAYA: Daphla Hills, *Lister*! ASSAM: Khasia Hills, *Simons*! Silhet, *Wallich*! CHITTAGONG: at Kasalong, *Lister*! *Clarke* 19744! Thandacheri, *King's Collector*! BURMA: Pegu, *Kurz*! ANDAMANS: S. Andaman, very common, *E. H. Man*! *King's Collectors*!

The Western India locality cited for this species by Benth and Baker is erroneous; all the specimens from the Concan so named by them are *D. volubilis*.

49. *DALBERGIA COLLETTII* Prain, *Journ. As. Soc. Beng.* lxvi. 2. 445 (1897).

BURMA: Shan Hills, *Collett* 591! 723!

The writer has erroneously described this as a tree; it is a large climber.

50. *DALBERGIA MIMOSOIDES* Franch. *Pl. Delavayanæ* 187 (1890). *D. Milletti* Prain, *Journ. As. Soc. Beng.* lxvi. 2. 446 (1897) hardly of Benth. *D. tamarindifolia* Roxb. *Flor. Ind.* iii. 223 in part (1832); *Wight, Icon.* t. 242 as to fruit only (1840).

KHASIA Hills; at 1-2000 ft. elev., *Mann*! Shampung, 4000 feet, *Collett*! Sohra, 4500 feet, *Gallatly*! *Clarke* 18845! Maoksandram, 4000 feet, *Clarke* 42875! CHINA: Yunnan, in woods above Tapintze, *Delavay* 1982! Szechuen, near Tatchienlu, 9000 feet, *Pratt* 275.

This is very near *D. Milletti* from Hongkong and was in 1897 referred to that species by the writer. An opportunity, most obliging furnished by MM. Bureau and Franchet, of examining the type of M. Franchet's *D. mimosoides* shows that the Khasia plant is exactly the same as the Yunnan and Szechuen one and that the latter is probably best treated as specifically distinct from *D. Milletti*.

It may be mentioned in passing that *Dalbergia Delavayi* Franch., also kindly lent for study, does not belong to this genus but is a *Cladrastis*, *C. Delavayi*, hardly different from *C. sinensis* Hemsl.

51. *DALBERGIA STENOPHYLLA* Prain. A climber with lenticelled glabrous branches. *Leaves* 6-8 cm. long; leaflets 30-35, small, linear-oblong, obtuse, glabrous above, finely sparingly adpressed-puberulous beneath, rather close-set, 1 cm. long, 3 mm. wide, rachis 5.5-7 cm. long and very short petiolules glabrous. *Flowers* small, secund, in axillary paniced cymes 3-5 cm. long, 1.5-4 cm. wide, peduncle, branches and short pedicels finely puberulous, bracts and 2 bracteoles at base of calyx

embracing lower third of tube ovate, persistent, small. *Calyx* 2.5 mm. long, campanulate, teeth short, obtuse, one-third as long as tube except the lower acute two-thirds the length of tube. *Corolla* white, 5 mm. long, claws of petals short. *Stamens* 9, monadelphous. *Ovary* stipitate, glabrous; ovules 3. *Pod* thinly coriaceous, narrowly oblong or ligulate, rarely ovate-acute; 2- or 1-seeded, 2–3 cm. long if one-seeded, 5 cm. long if 2-seeded; 1 cm. wide; rather distinctly reticulated throughout, not indurated opposite the seed.

CHINA: Hupeh, *Henry* 1355! 1950! 3852! 4135! 6188! Szechuen, Ky-min-se near Tchan-Keon, *Farges* 1075!

M. Farges gives the Chinese name of this as Kang-kin-ten. It is very nearly related to both *D. Milletti* and *D. mimosoides* but has narrower leaflets and much narrower pods than either.

52. *DALBERGIA MILLETTI* Benth., *Journ. Linn. Soc.* iv. *Suppl.* 34 (1860); *Flor. Hongkong* 92 (1861). *D. polyphylla* Benth., *Pl. Jungh.* i. 256 in part (1854); *Seem. Bot. Her.* 375 (1855). *Derris pinnata* Lour. *Flor. Cochín-Chin.* 432 (1793) possibly.

CHINA: Hongkong, *Hance* 1809! *Wilford*! *Ford*! *Champion*! Hupeh, *Henry* 3095! 6286! Yunnan, at Mengtze, 5000 feet, *Henry* 9975!

53. *DALBERGIA HANCEI* Benth. in *Journ. Linn. Soc.* iv. *Suppl.* 54 (1860); *Flor. Hongkong* 93 (1861).

CHINA: Hongkong, *Hance* 1810! *Ford*! *Wilford*! *Weiss*! Macao; *Calléry* in *Herb. Gaudichaud*, voy. Bonité! Near Canton, *Park* 35!

54. *DALBERGIA THOMSONI* Benth. in *Journ. Linn. Soc.* iv. *Suppl.* 33 (1860); *Bak. in Hook f. Flor. Brit. Ind.* ii. 236 (1876).

ASSAM: Patkoye Mts., *Griffith* 1799/1 K.D.! Khasia, *Hooker & Thomson*! *Clarke*!

This species is not a *Dalbergaria*, but a *Triptolemea*.

55. *DALBERGIA SCORTECHINII* Prain, *Journ. As. Soc. Beng.* lxi. 2. 444 (1897). A shrubby climber 15–30 feet long with twining glabrous branches here and there twisted and thickened into spiral hooks. *Leaves* 15–20 cm. long, leaflets 11–15, elliptic, closely puberulous beneath, glabrous except midrib above, 1.5–4 cm. (rarely in young shoots 6 cm.) long, 1–2 (rarely 2.5) cm. wide, rachis 8–10 cm. long and petiolules 4 mm. long densely puberulous. *Flowers* minute, secund, in an ample terminal and in smaller axillary paniculate cymes 5 cm. wide and as long as the leaves; peduncles, branches and pedicels pubescent; bracts caducous; bracteoles persistent one at base of short pedicels lanceolate acuminate and two at base of calyx ovate obtuse embracing lower third of calyx-tube. *Calyx* 2.5 mm. long, campanulate, teeth short, obtuse, one-third as long as tube, except the acute lowest half as long as tube.

Corolla white, 4 mm. long, claws of petals short. *Stamens* 9, sub-3-adelphous, the central ob vexillary stamen being separated almost or quite to the base from the lateral groups of 4 each. *Ovary* pubescent, shortly stipitate; style short; ovules usually 3-4, sometimes only 2, rarely more than 4. *Pod* coriaceous, narrowed at both ends, 4-5 cm. long, 1.25 cm. wide, 1-3-seeded. *D. Junghuhnii* var. *Scortechinii* Prain, *Journ. As. Soc. Beng.* lxvi. 2. 115 (1897).

MALAYA: Penang; Ayer Etam, *Curtis* 1437! Malacca; Bijong, *Scortechinii* 1830! *Maingay* 549 (*Herb. Propr.* 1554)! Singapore; Bukit Timah, *Ridley* 6406! Bangka; *Teysmann*! Java; Djampong, *Teysmann* 1418! Borneo; Sarawak, *Beccari* 2887! *Haviland* 2893!

56. *DALBERGIA CURTISII* Prain. A scandent shrub with puberulous branches. *Leaves* 15-18 cm. long; leaflets usually 7-9, oblong or elliptic, rounded obtuse and faintly emarginate at apex, cuneate rarely rounded at base, glabrous above, rather closely puberulous except on the midrib beneath, 3-5 cm. long, 2.5 cm. wide; rachis 11-12 cm. long and petiolules 4 mm. long puberulous. *Flowers* minute, secund, in large axillary panicles exceeding the leaves, peduncles branches and pedicels pubescent; bracteoles persistent, one at base of pedicel lanceolate, 2 at base of calyx ovate obtuse embracing the lower third of calyx-tube. *Calyx* 2.5 mm. long, campanulate, teeth short obtuse one-third as long as tube. *Corolla* white, 4 mm. long, claws of petals short. *Stamens* 9, monadelphous. *Ovary* pubescent; ovules 2-3. *Pod* thin, membranous, not seen ripe. *D. discolor* Miq. *Flor. Ind. Bat. Suppl.* 296 (1860) *nec* Bl. *D. Junghuhnii* Bak. in *Flor. Brit. Ind.* ii. 233 (1876) partly; Prain, *Journ. As. Soc. Beng.* lxvi. 2. 115 (1897) partly, not of Benth.

MALAYA: Penang, 500 ft., *Curtis*! Malacca, *Maingay*! Sumatra; Lampongs, *Teysmann*!

This species is nearest to *D. stercoracea* Maingay, but in a note by Maingay himself it is remarked that, while this is the case, the two are very distinct. This has no trace of the foetid odour characteristic of *D. stercoracea*. The two species have been confused by Mr. Baker and myself with each other and also with *D. Junghuhnii*. Miquel, whose specimens I have seen, has named this *D. discolor*; it is, however, very unlike the Bornean species so named by Blume, and previously described by Miquel himself under Blume's name.

57. *DALBERGIA STERCORACEA* Maing. *Mss. in Herb. Kew.* *D. Junghuhnii* Bak. in *Hook. f. Flor. Brit. Ind.* ii. 233 in part (1876); Prain, *Journ. As. Soc. Beng.* lxvi. 2. 115 var. *typica* in part (1897), not of Benth. *D. frondosa* Miq. *Flor. Ind. Bat.* i. 133 (var. *typica* only and *exclud. all synonyms*), (1855), not of Roxb.

MALAYA: Malacca, *Maingay*! *Mueller*! *Derry*! Singapore, *Hullett*! *Ridley*! Sumatra, *Korthals*!

This has been confounded with *D. Junghuhnii* Benth. by Mr. Baker and the writer. The fewer differently-shaped leaflets and the stercoreaceous odour of the flowers amply distinguish it. Miquel, whose Sumatra specimens of "*D. frondosa*" have been seen by the writer, has named it as above. Both *D. sennoides* Bl. and *D. phyllanthoides* Bl. have been included here by Miquel but authentic examples of these, named by Blume, have been seen by the writer and their true place is indicated under the latter species.

58. *DALBERGIA MELANOXYLON* Guill. & Perr. *Flor. Seneg. Tent.* 227, t. 33 (1834); *Benth., Journ. Linn. Soc. iv. Suppl.* 47 (1860). *D. Stocksii* Benth., *Journ. Linn. Soc. iv. Suppl.* 42 (1860); *Bak. in Hook. f. Flor. Brit. Ind. ii.* 234 (1876).

WESTERN INDIA: Concan, *Stocks!* Canara, *Talbot!* also at Poona, cult. Woodrow! Madras, cult. *Wight's Collector!* Calcutta, cult. *Thomson!* *Anderson!* *King!* etc. DISTRIB.—Africa, from Senegal to Abyssinia and Mozambique.

The examination of Stocks' specimens, and of some exactly like them from Canara in Mr. Talbot's herbarium, makes it certain that the plant termed *D. Stocksii* by Bentham is the African *D. melanoxyton*, as represented by many specimens in the Herbaria of Kew, the British Museum, Mr. de Candolle and Calcutta. The same species has been in cultivation at Calcutta at least since 1858, that being the earliest date on our herbarium specimens collected in the Gardens. At Madras it appears to have been in cultivation about as long. There is nothing about Stocks' specimens to indicate whether that botanist considered the tree indigenous or introduced, but the note by Mr. Talbot that the plant is known in Western India as "Chinese Blackwood," as opposed to *D. latifolia* or "Bombay Blackwood," points to a foreign origin.

59. *DALBERGIA MULTIFLORA* Heyne ex Wall. in *Cat. sub.* n. 5848 (1832). *Dalbergia sympathetica* Nimmo in *Grah. Cat. Bomb. Pl.* 55 (1839); *Voigt, Hort. Suburb. Calcutt.* 241 (1845); *Benth., Pl. Jungh.* 255 (1854); *Journ. Linn. Soc. iv. Suppl.* 42 (1860); *Dalz. & Gibs., Bomb. Flor.* 78 (1861); *Bak. in Hook. f. Flor. Brit. Ind. ii.* 234 (1876); *Talbot, Bomb. List* 75 (1894). *D. frondosa* Wall. *Cat.* 5855 partly (1832); *W. & A. Prodr.* 266 partly (1834), not of Roxb. *D. paniculata* Wall. *Cat.* 5848 partly (1832), not of Roxb.—Anamullu Rheede, *Hort. Malabar.* viii. 40.

WESTERN INDIA: Concan, *Stocks!* Kuntze! Canara, *Talbot!* Mysore, *Heyne!* *Wight!* Travancore, *Lawson* 205!

VAR. *glabrescens* Prain; leaflets glabrous above, glabrescent or sparingly pubescent beneath.

SOUTHERN INDIA: Carnatic, *Wight* 819 K.D.! *G. Thomson!* Courtallam, *Wight* 267! Travancore, *Lawson* 218!

In 1897 the writer pointed out in this *Journal* (vol. lxvi. pt. 2, p. 446) that Wallich's n. 5848 B (from *Herb. Heyne*) is this species and not, as Wallich erroneously supposed, *D. paniculata*. Working subsequently through the British Museum

collection the writer discovered a note on a sheet of *D. sympathetica* Nimmo, from Herb. Wight in Herb. Shuttleworth, in Mr. Benthams handwriting, which shows that that learned botanist had already made this discovery. The note is as follows:—
 “This is a distinct species for which Heyne’s name *D. multiflora* may be retained unless it turns out be one of Roxburgh’s. I have it in flower from Arnott who, in his Prodrömus, appears to have confounded it with *D. frondosa*. He had it not then in flower.”

This being the *Amerimnum horridum* of Dennstedt [*Schlüs. Hort. Malabar.* 34 (1818)] it ought perhaps to receive the name *Dalbergia horrida*; the objection to using this name is the existence of a synonym *D. horrida* Grah. which is the equivalent of *D. spinosa* Roxb.

60. DALBERGIA PHYLLANTHOIDES Blume ex Miq. in *Flor. Ind. Bat.* i. 1. 134 (1855).

VAR. *typica*; leaflets membranous. *D. frondosa* Miq. VAR. β . *Flor. Ind. Bat.* i. 1. 134 (1855). *D. polyphylla* Benth. *Mss. in Herb. Kew* (*Journ. Linn. Soc. iv. Suppl.* 34 partly) not of *Pl. Junghuhn*.

MALAYA: Java, Blume! Nagel 387! Borneo, Barber! Motley 32!

VAR. *sennoides* Prain; leaflets firmer, larger. *D. sennoides* Bl. ex Miq. *Flor. Ind. Bat.* i. 1. 134 (1855). *D. Junghuhnii* Benth., *Journ. Linn. Soc. iv. Suppl.* 33 in part (*Malacca plant only*) (1860); Bak. in *Hook. f. Flor. Brit. Ind.* ii. 233 partly (1876), not of Benth. in *Pl. Junghuhn*. *D. subsympathetica* Prain, *Journ. As. Soc. Beng.* lxvi. 2. 116 (1897). *D. littoralis* Hassk. *Mss. in Herb. Hort. Bog.*

MALAYA: Perak, Scortechini 201! 1071! Wray 2086! 3205! *Kunstler* 2354! 3562! 4978! 5182! Penang, *Curtis* 1492! Malacca, *Griffith*! *Goodenough*! *Jagor*! *Maingay*! Java, cult. in Hort. Bogor.

The opportunity of examining authentic examples of Blume’s and Miquel’s specimens in the Leiden Herbarium, kindly afforded by the late Prof. Suringar, has permitted a settlement of the confusion in synonymy connected with this species, the validity of which the writer had already established in 1897.

61. DALBERGIA JUNGHUHNII Benth., *Pl. Jungh.* i. 254 (1854); Miq. *Flor. Ind. Bat.* i. 1. 129 (1855); Benth., *Journ. Linn. Soc. iv. Suppl.* 33, in part and as regards the Sumatra locality only (1860).

MALAYA: Sumatra, at 3000 ft. elev., *Junghuhn*. 233! Java, *de Vriese*!

62. DALBERGIA COROMANDELIANA Prain. An erect glabrous shrub, the ultimate branches distichous, horizontal, rigid, spinous. Leaves fasciculate, 3–4 cm. long, leaflets 7–9, elliptic or cuneate-oblong, retuse, 6–9 mm. long, 3–5 mm. wide, glabrous even when young on both surfaces, rachis 2.5–3.5 cm. long, puberulous when young, soon glabrous; petiolules 1 mm. long, glabrous. Flowers minute, secund, in small recurved fascicled cymes, rachis puberulous, 1–1.5 cm. long, pedicels 3 mm. long, glabrous; bracteoles caducous, one at base of pedicel lanceolate, 2 at base of calyx ovate, subacute, embracing lower third of calyx-tube. Calyx 2.5 mm.

long, campanulate, teeth short, obtuse, one-third as long as tube. *Corolla* white, 4 mm. long, claws of petals short. *Stamens* 9—10, monadelphous, diadelphous, or 3-adelphous the ob vexillary stamen being free. *Ovary* glabrescent; ovules 3—4. *Pod* thinly coriaceous, distinctly wide-reticulate throughout, quite glabrous, narrow-ovate, 3.5 cm. long, 1.5 cm. wide, distinctly stipitate and cuneate at base, subacute at apex, 1-seeded. *D. spinosa* W. & A. *Prodr.* i. 266 (1834), *not of Roxb.*

SOUTHERN INDIA: exact locality not stated, *Wight* 798 (821 K.D.) flower! Shevaghiri Hills, *Wight* 822 K.D. fruit!

Though much like *D. spinosa* in general appearance this is very distinct even as regards leaves and flowers, and is wholly distinct as regards fruit. Its nearest ally is in reality *D. multiflora*, but the much smaller cymes with much longer pedicels, and the much smaller quite glabrous pod amply distinguish it. The leaflets too are much smaller and fewer than in *D. sympathetica* so that it is easily distinguished, even by its foliage, from *D. sympathetica* var. *glabrescens* where, as in this, the leaflets may be glabrous. The spines of this plant are straight as in *D. spinosa*. The stamens, as in the case of *D. melanoxyton*, may be variously monadelphous, diadelphous or 3-adelphous.

63. *DALBERGIA DISCOLOR* Bl., *Miq. Flor. Ind. Bat.* i. 1. 130 (1855); *Benth. in Journ. Linn. Soc.* iv. *Suppl.* 41 (1860).

MALAYA: Borneo, southern coasts, *Korthals*! Celebes, *Teysmann* 12539!

This species has been tentatively placed by Bentham near *D. foliacea*; it is most nearly related to *D. rimosa*.

64. *DALBERGIA RIMOSA* Roxb. *Hort. Beng.* 53 (1814); *DC. Prodr.* ii. 417 (1825); *Roxb. Flor. Ind.* iii. 233 (1832); *Wall. Cat.* 5853 (1832); *Wight Ic.* t. 262 (1840); *Voigt, Hort. Suburb. Calcutt.* 241 (1845); *Benth., Journ. Linn. Soc.* iv. *Suppl.* 32 (1860); *Brandis, For. Flor.* 148 (1874); *Bak. in Hook. f. Flor. Brit. Ind.* ii. 232 (1876). *D. foliacea* Wall. (*pro parte*) *Cat.* 5856 B; *Gamble, Darjeeling List*, 29 (1896), *nec* Wall. *Dalbergia* sp. *Drake del Castillo, Journ. de Bot.* v. 215 (1891).

SIKKIM: Lower Hills, Terai and Duars; *Hooker*! *King*! *Gamble*! *Gammie*! *Haines*! ASSAM: Brahmaputra Valley; *Jenkins*! *Simons*! *Mann*! *King's Collectors*! *Masters*! *Peal*! *Silhet*; *Wallich*! *Clarke*! *Cachar*; *Praser*! *Khasia*; *Griffith* 1801! *Hooker & Thomson*! *Clarke*! *Mann*! *Gallatly*! *Naga Hills*; *Clarke*! *Watt*! BURMA: Kachin Hills, *Prain's Collectors*! TONKIN: Black river, *Balansa* 2293!

The Tonkin specimens have the leaflets glabrous beneath and the venation slightly different from that in the leaves of typical *D. rimosa*.

65. *DALBERGIA FORBESII* Prain. A moderately large climbing shrubs with glabrous branches. *Leaves* 13—18 cm. long, leaflets usually 5, ovate-acuminate, base rounded, thinly coriaceous, closely finely reticu-

late, glabrous on both surfaces the terminal exceeding the others, 4-9 cm. long, 2-4 cm. wide, rachis 6.5-9 cm. long and petiolules 5 mm. long glabrous. *Flowers* numerous small, secund, in dichotomous cymes disposed in terminal corymbose wide panicles extending into the axils of the upper leaves, 12-15 cm. long, 8-10 cm. wide, shortly pedicelled, 2-bracteolate below the calyx, bracteoles persistent. *Calyx* campanulate, 5-toothed, teeth all obtuse, subequal, rather shorter than the tube. *Corolla* white, the petals rather distinctly clawed; standard orbicular, subauriculate, slightly emarginate. *Stamens* 9, in a sheath slit along the back; sometimes a free vexillary stamen present. *Ovary* glabrous, shortly stipitate, style short; ovule solitary. *Pod* distinctly stipitate, coriaceous, oblong, glabrous, veined opposite the seed, 4-6 cm. long, 2 cm. wide, 1-seeded. *Seed* reniform, much compressed. *D. parviflora* Prain, *Journ. As. Soc. Beng.* lxvi. 2. 121 (1897) *in part, not of Roxb.*

MALAYA: Lingga, *Teysmann!* Bigni Telok, 3500 feet, *Forbes* 3216! *Warburg* n. 20310, in Herb. Berol., leaf-specimens from the Aru Islands, appears the same.

This the writer in 1897 supposed to be a form of *D. parviflora*, but the opportunity of examining its fruits, afforded by the kindness of Dr. Treub, who lent the Herbarium material of *Dalbergia* from Buitenzorg, shows that this is a very distinct species.

66. *DALBERGIA ALBERTISII* Prain. A climbing shrub; young branches terete. *Leaves* 18-20 cm. long; leaflets 8-9, lateral distinctly alternate, very dark-green and quite glabrous on both surfaces, firmly coriaceous, midrib impressed above, prominent beneath, secondary nerves faint especially above, rather numerous, ovate-acute with rounded base, terminal rather the largest, 7 cm. long, 3.25 cm. wide; rachis 14-16 cm. long, and petiolules 3 mm. long glabrous. *Flowers* minute, secund, in ample terminal thyrsoïd panicles, with sparsely puberulous, zigzag rachis 12 cm. long, giving off at each angle stoutish, horizontal branches 2.5 cm. long, breaking at their tips into 2 or more reflexed cyme-branches; bracts and bracteoles minute, deciduous. *Calyx* 1.5 mm., teeth short obtuse. *Corolla* and *stamens* not seen. *Pod* thin, membranous, green, suborbicular apiculate and 1-seeded, rarely oblong and 2-seeded, slightly cuneate at the base, 2.5-4 cm. long, 2 cm. wide, 2 mm. thick, finely puberulous, rather distinctly wide-reticulate throughout, with a short but distinct stipe 4 mm. long.

NEW GUINEA: Fly River, *D'Albertis!*

A very distinct species with the inflorescence of the group to which *D. multiflora* and *D. Junghuhnii* belong, but differing in the bracteoles not being persistent and still more in foliage. Its nearest ally is *D. Forbesii* from Sumatra, a species with much thinner leaves.

6. *Triptolemesæ Pseudoselenolobieæ*.

67. DALBERGIA PARVIFLORA *Roxb. Hort. Beng.* 98 (1814); *Flor. Ind.* iii. 225 (1832); *Miq. Flor. Ind. Bat.* i. 1. 132 (1855); *Benth., Journ. Linn. Soc.* iv. *Suppl.* 33 (1860); *Prain, Journ. As. Soc. Beng.* lxi. 2. 121, *excl. syn.* *D. Cumingiana Benth.* (1897). *D. Zollingeriana Miq. Flor. Ind. Bat.* i. 1. 130 (1855). *D. Cumingii* var. *Zollingeriana Benth., Journ. Linn. Soc.* iv. *Suppl.* 32 (1860). *D. corymbifera Bl. ex. Miq. l.c.* (1855). *Drepanocarpus Cumingii Kurz, Flor. Flor. Brit. Burma* i. 336 (1877).

BURMA: Tenasserim, *Helfer* 1808! MALAYA: Dindings, *Curtis!* Pahang, *Ridley!* Perak, *Wray* 2525! *Kunstler* 1423! 5937! 6151! Sumatra, *Zollinger* 3041! *Teysmann* 4440! Java, *Blume* (type of *D. corymbifera*)! *Teysmann!* Borneo; Sarawak, at Bintulu, *Beccari* 3651! at Sungei Mahan, *Beccari* 3585! at Santubong, *Beccari* 2149! Celebes, *Zollinger* (type of *D. Zollingeriana* *Miq.*)! *Halmaheira, Teysmann* 5668! *Moluccas; Amboina, C. Smith!*

Possibly this is cultivated in Tenasserim. The original ticket of *Helfer's* n. 1808 shows that it came from Tenasserim not the Andamans; it was found at the 3rd Camp from Tenasserim in clearings in a native garden.

This yields the Kayoe Lakka of commerce. *Beccari* describes it as a spiny climbing shrub, the spines woody and branched. Its Malay name is *Acor Berangan*. Old stems stripped of alburnum and dead are reddish (*rosso-ciliegio*) and are termed *Caju Lacca*—used by the Chinese in their ceremonies with other odoriferous woods. The opportunity of examining good specimens of *Cuming's* n. 1244 in *Herb. De Candolle* and of studying the fine suite of specimens of *D. Cumingiana* in *Herb. Kew* has enabled the writer to see that the two species, though united by *Mr. Benth.*, are very distinct.

68. DALBERGIA CUMINGIANA *Benth., Pl. Junghuhn.* 255 (1854); *Miq. Flor. Ind. Bat.* i. 1. 129 (1855). *D. Cumingii Benth., Journ. Linn. Soc.* iv. *Suppl.* 32, *excl.* var. *Zollingeriana* (1860).

PHILIPPINES: Luzon, *Cuming* 1244! *Vidal* 735! *Pili, Vidal* 1255! *Catarman, Isd. of Samar, Vidal* 255!

69. DALBERGIA GODEFROYI *Prain.* A woody climber, branchlets subdistichous, recurved, puberulous. *Leaves* 7–8 cm. long, leaflets 6–9, wide ovate, firmly papery, finely puberulous on both surfaces, base rounded, apex rounded or slightly emarginate, 1.5–3 cm. long, 1–1.75 cm. wide, rachis 4–5 cm. long and petiolules 2.5 mm. long puberulous. *Flowers* in axillary, subsimple racemes forming terminal, leafy panicles, rachis puberulous. *Calyx* campanulate, in fruit glabrescent or puberulous, pedicels 2.5 mm. long, teeth subequal, obtuse, shorter than tube except the lowest lanceolate about as long as tube. *Petals* and *stamens* not seen. *Pod* obliquely subreniform, thinly woody, 2 cm. long, 1.25 cm. wide, 4 mm. thick, finely closely velvety externally, with a flattened

stipe 5-1.25 cm. long, also velvety, and ovuligerous in its upper part. *Seed* compressed, reniform, 8 mm. long, 4 mm. wide.

SIAM: South-west of the Great Lake, *Godefroy* 288!

A very distinct species, evidently belonging to the same group as *D. Cumingiana* and *D. parviflora*, but well-marked by its closely finely velvety pods.

70. *DALBERGIA BECCARII* Prain. A climbing shrub with slender, terete, densely finely pubescent branches. *Leaves* sub-2-farious, 3-4 cm. long, leaflets 11-19, oblong, slightly emarginate at the apex, dark-green above rather paler beneath, finely pubescent on both surfaces, 8 mm. long, 4 mm. wide; rachis 3.5 cm. long and very short petiolules pubescent; stipules lanceolate, 2 mm. long. *Flowers* very minute, secund, in small cymes in the lower leaf-axils, under 1 cm. wide; rachis and pedicels puberulous; bracts and bracteoles deciduous, very minute. *Calyx* 1.5 mm. long, campanulate, teeth short, obtuse, one-third as long as tube except the lower acute three-fourths the length of the tube. *Corolla* not seen. *Stamens* monadelphous. *Ovary* glabrous. *Pod* firm, thickish, pale-brown, coriaceous, glabrous, 1-seeded, irregularly ovate, apiculate, 1.25 cm. long, 8 mm. wide, 2.5 mm. thick, with a short but distinct stipe 2.5 mm. long. *Ormocarpum scandens* *Teysm. Mss. in Herb. Beccari.*

BORNEO: Sarawak, Kuching, *Beccari* 566! 1105! Kapuas, *Teysmann* 8254!

71. *DALBERGIA SPINOSA* Roxb. *Hort. Beng.* 98 (1814); *Flor. Ind.* iii. 226 (1832); *Voigt, Hort. Suburb. Calcutt.* 241 (1845); *Benth., Journ. Linn. Soc. iv. Suppl.* 49 excluding citation *Wight* 798 (1860); *Bak. in Hook. f. Flor. Brit. Ind.* ii. 238 excl. ref. *W. & A. Prodr.* (1876); *Talbot, Bombay List* 75 (1894). *D. horrida* *Grah. in Wall. Cat.* 5877 (1832); *Drepanocarpus spinosus* *Kurz, For. Flor. Brit. Burma* i. 337 (1877).

S. INDIA: Arcot, *Gamble* 18212! Madras, *Heyne* (*Wallich, Cat.* 5877 B)! W. INDIA: Concan, coast, fide *Talbot*. BENGAL: Sundribuns, *Kurz*! *Clarke*! *Ball*! *Heinig*! *Griffith* 1811! CHITTAGONG: coast, *Roxburgh*. BURMA: Rangoon, *Kurz* 1762! Moulmein, *Wallich*!

III. *SELENOLOBIUM* Benth.

7. *Selenolobieæ Pseudodalbergariæ.*

72. *DALBERGIA RENIFORMIS* Roxb. *Hort. Beng.* 53 (1814); *Flor. Ind.* iii. 226 (1832); *Wight, Icones* i. 261 (1840); *Bak. in Hook. f. Flor. Brit. Ind.* ii. 238 (1876). *D. flexuosa* *Grah. in Wall. Cat.* 5875 (1832); *Benth., Journ. Linn. Soc. iv. Suppl.* 48 (1860). *D. stipulata* *Wall. Cat.* 5868 partly (1832). *Drepanocarpus reniformis* *Kurz, For. Flor. Brit. Burma* i. 336 (1877).

ASSAM: *Smith* (*Herb. Roxb.*)! *Silhet, deSilva*! *Clarke* 42711!

Cachar, *Prager* 149 ! BURMA : Pegu, *Kurz* 1785 ! 2608 ! *Brandis* ! Tenasserim, *Oleghorn* ! *Falconer* ! *Gallatly* ! *Beddome* !

An original example of *D. reniformis*, so named by Roxburgh himself, is preserved in the Brit. Mus. collection. The stamens in this species are isodadelphous.

8. *Selenolobium Pseudosissoe*.

73. *DALBERGIA FALCATA Prain*. A climbing shrub ; young branches angular, rusty-puberulous, their bases beset with ovate-acute, subcoriaceous bracts 2·5 mm. long. *Leaves* 10–16 cm. long, leaflets 5–9, the lateral ones approximate but hardly ever opposite, dark-green above, pale beneath, glabrous above, finely sparsely adpressed-pubescent beneath, chartaceous, ovate shortly abruptly acuminate, the terminal 7–8 cm. long, 3 cm. wide, progressively smaller downwards, midrib rather prominent beneath, secondary veins 6–8 pairs fine but distinct beneath, as are the reticulations ; rachis 4·5–10 cm. long, and petiolules 3–4 mm. long glabrous ; stipules lanceolate, slightly striate within, pubescent externally, 8 mm. long. *Flowers* in axillary panicles 6–8 cm. long, with spreading rusty-puberulous branches, bracts and bracteoles deciduous, pedicels 2·5 mm. long. *Calyx* 3 mm. long, teeth lanceolate except the upper, the lowermost as long as the tube. *Corolla* not seen. *Stamens* monadelphous. *Ovary* rusty-pubescent. *Pod* finely puberulous, at length glabrescent, rigid, falcate, not very greatly thickened, 1–2-seeded, 3 cm. (when 2-seeded 5·5 cm.) long, 1·75 cm. wide, 6 mm. thick, with a distinct, slender, puberulous stipe 8 mm. long, dark-brown when ripe, with narrow grey lines alongside the ventral suture.

BORNEO : Bintulu, *Beccari* 4027 ! Sarawak, *Beccari* 67 !

A very distinct member of the group to which *D. reniformis* and *D. Kunstleri* belong.

74. *DALBERGIA KUNSTLERI Prain, Journ. As. Soc. Beng.* lxvi. 2. 121 (1897) and 453 (1897).

MALAYA : Perak, *Kunstler* 4736 ! 7067 !

This is obviously very closely related to *D. reniformis* but it has, if not always, at least usually monadelphous stamens.

V.—*Materials for a Flora of the Malayan Peninsula*.—By SIR GEORGE KING, K.C.I.E., LL.D., F.R.S., &c., late Superintendent of the Royal Botanic Garden, Calcutta.

[Received April 2nd ; Read June 5th, 1901.]

No. 12.

The present contribution to these *Materials* is occupied exclusively by an account of the Natural Order *Myrtaceæ*. In the sequence followed in *Hooker's Flora of British India*, which has been adopted in these papers, this family ought to have immediately preceded *Melastomaceæ*. But, for reasons which are of no importance to any one besides the author, the account of the latter order was prepared first and was published in the eleventh of these papers. In the present paper 122 species, belonging to 11 genera, are described. Six of these genera are represented by only a single species; two of them by 2 species; one by 5, one by 11, and the remaining one (*Eugenia*) by no fewer than 96 species. The latter genus is a very perplexing one, from the fact that the species resemble each other so closely. It is impossible to limit the genus by really good well-marked characters, and it is equally impossible to divide it into sub-genera by characters which do not break down. *Eugenia* seems to be essentially a genus in the evolution of which an extraordinary number of the successive forms have been preserved. I have adhered to the arrangement of the species into the groups *Jambosa* and *Syzygium*, although there are many species which might be referred to either. Nobody can be more dissatisfied than I myself am with the *clavis* of the species which I have prepared. In fact, while dealing with this genus and with its literature, the belief has been forced upon me that verbal descriptions are of very little use in identifying the species, and that the only safe way of doing so is by comparison with authentically named Herbarium specimens.

Order XLVI. MYRTACEÆ.

Trees or shrubs, rarely herbs. *Leaves* opposite, seldom alternate or whorled, petioled, simple, entire, rarely denticulate or crenate, 3-nerved or pinnately-nerved and usually with an intramarginal nerve, generally coriaceous, and dotted with pellucid glands. *Stipules* if present small and deciduous. *Flowers* regular, very rarely irregular, hermaphrodite, or polygamous by abortion, axillary, solitary or in spikes cymes corymbs or heads, naked or with an involucre, often with 2 bracts at the base, white, pink, purple, or yellow, never blue. *Calyx* superior or $\frac{1}{2}$ -superior, limb 4-5-many-fid or -partite, persistent or deciduous,

valvate or imbricate, sometimes entire or closed in bud. *Petals* inserted on a disk surrounding the cavity of the calyx, equal in number to the calyx-lobes and alternate with them, rarely 0. *Disc* lining the calyx-tube, stamiferous at the margin. *Stamens* usually numerous, inserted with the petals in several rows, rarely definite and alternate with the petals; filaments free or more or less coherent at the base or in bundles opposite the petals; anthers small roundish, with parallel cells bursting longitudinally. *Ovary* inferior or $\frac{1}{2}$ -inferior, crowned by a fleshy disk, 1-celled with 1 or more ovules, or more usually 2-many-celled with many ovules; placentation axile (parietal in *Rhodamnia*); style terminal rarely lateral, smooth or bearded at the summit; stigma undivided. *Fruit* usually crowned by the calyx-limb, either 1-celled and 1-seeded by abortion, or 2-many-celled with loculicidal dehiscence; or baccate and indehiscent with the cells many-seeded or 1-seeded by arrest. *Seeds* angular cylindric or compressed; testa hard or membranous, sometimes winged; albumen 0; embryo straight curved or spirally twisted, cotyledons usually short and obtuse sometimes combined into a mass with the radicle, very rarely leafy, radicle often thick. **DISTRIB.**—Tropical and sub-tropical regions of both hemispheres; species upwards of 2800.

TRIBE I. *Leptospermeæ*. Fruit capsular; leaves opposite or alternate.

Leaves narrow.

Flowers few or solitary in the leaf-axils.

Stamens 10 or fewer, free, in a single series; leaves

opposite 1. *BECKEA*.

Stamens numerous, free, in a single series; leaves alter-

nate 2. *LEPTOSPERMUM*.

Flowers in heads or spikes; leaves usually alternate;

stamens numerous, slightly combined into bundles

opposite to and longer than the petals 3. *MELALEUCA*.

Leaves broad.

Flowers in axillary cymes; leaves alternate; stamens

indefinite, united into 5 bundles opposite to and shorter

than the petals 4. *TRISTANIA*.

TRIBE II. *Myrteæ*. Fruit a berry; leaves opposite, often gland-dotted.

Ovary 1-celled with 2 parietal multi-ovulate placentas:

flowers small; leaves 3-nerved from the base 5. *RHODAMNIA*.

Ovary 1-3-celled with 2 rows of ovules in each cell separated by spurious partitions; flowers rather large; leaves

3- to 5-nerved at the base, seeds numerous 6. *RHODOMYRTUS*.

Ovary 5- (sometimes 4-) celled, with several ovules in each

cell, often with spurious partitions; seeds few; embryo

long and narrow with small cotyledons: flowers small and

numerous; leaves not 3-nerved 7. *DECASPERMUM*.

Ovary 2-3-celled with several ovules in each cell, without spurious partitions; embryo thick, fleshy; cotyledons large radicle short; seeds few; stamens numerous ... 8. EUGENIA.

Ovary 2-celled with numerous ovules in each cell; flowers small, few, in small axillary inflorescences. Stamens 8: otherwise as in *Eugenia* ... 9. PSEUDO-EUGENIA.

TRIPE III. *Lecythideæ*. Fruit hard and fibrous or fleshy, indehiscent; leaves alternate, not gland-dotted.

Stamens all antheriferous, staminodes none; embryo undivided; fruit angular, one-seeded ... 10. BARRINGTONIA.

Inner stamens shorter and without anthers; embryo involute; the cotyledons leafy, plicate: fruit ovoid, several-seeded ... 11. PLANCHONIA.

1. BÆCKEA, Linn.

Glabrous heath-like shrubs. *Leaves* opposite, narrow, pointed, entire, with many pellucid glands. *Flowers* 5-merous, rarely 4-merous, axillary, peduncled, with 2 minutely bracteolate. *Calyx-tube* widely campanulate; lobes 5, membranous, persistent. *Petals* 5, suborbicular. *Stamens* 10 or fewer, shorter than the petals. *Ovary* in the single Malay species $\frac{1}{2}$ -inferior, 2-3-celled, with several ovules in each cell. *Capsule* bursting from above loculicidally. *Seeds* angular; embryo straight with short cotyledons.—DISTRIB. Species about 50, the greater number Australian, a few in New Caledonia, one only extending into India.

There are considerable differences in the stamens amongst the species referred by Messrs. Bentham and Hooker to this Linnaean genus. Some of the species have only 5 stamens, while others (like the solitary Indo-Malayan one) have 10 which however are not unfrequently reduced to 8. There are moreover differences in the shape of the anthers and filaments. The ovaries also in some have two and in others three cells. On these and other characters more than a dozen genera were founded by Schauer and others, but these have been advantageously reduced to *Bæckea*.

BÆCKEA FRUTESCENS, Linn. Sp. Pl. 358. A slender shrub with thin wiry branches. *Leaves* linear, pointed, .25 to .5 in. long and .05 in. broad. *Flowers* axillary, .08 in. in diam., usually solitary, in short peduncles. *Calyx* with 5 rounded persistent lobes. *Stamens* 10 (or sometimes only 8). Ovary half-inferior. DC. Prod. III, 229: Sur. in Trans. Linn. Soc. III, 260; Bot. Mag. t. 2802; Blume Mus. Bot. I, 69; Miq. Fl. Ind. Bat. Vol. I. Pt. 1, 406; Suppl. 308; Benth. Fl. Hong-Kong, 118: Duthie in Hook. fil. Fl. Br. Ind. II, 463. *B. Cumingiana*, Schauer in Walp. Rep. II, 920. *B. chinensis*, Gært. Fruct. I, 157, t. 31. *B. sumatrana*, Bl. Mus. Bot. I, 69.

In all the provinces except the Andaman and Nicobar Islands. DISTRIB.—Malayan Archipelago.

2. LEPTOSPERMUM, Forst.

Shrubs or small trees, glabrous or silky-pubescent. *Leaves* alternate, entire, rigid, with 1-3 nerves or nerveless. *Flowers* solitary and axillary, or 2-3 together at the ends of the branches, rarely peduncled, sometimes polygamous; bracts broad, scarious, often imbricate, the lower ones caducous. *Calyx-tube* broadly campanulate or turbinate, adnate to the ovary below, the free upper part broad; lobes 5. *Petals* 5, spreading. *Stamens* numerous, in a single series, not longer than the petals; anthers versatile, their parallel cells bursting longitudinally. *Ovary* inferior or $\frac{1}{2}$ -inferior, enclosed in the calyx-tube, 5- or more-celled, rarely 3- or 4-celled; style filiform, inserted in a deep depression of the ovary, sometimes short; stigma capitate or peltate. *Capsule* usually exceeding the calyx-tube, opening loculicidally from above. *Seeds* numerous, linear or winged, often sterile; embryo straight. **DISTRIB.**—Species upwards of 30, chiefly Australian, a few in New Zealand and New Caledonia.

NOTE.

As in *Bæckea* the species have been separated off into several genera which have been reduced by Messrs. Bentham and Hooker.

LEPTOSPERMUM FLAVESCENS, Sm. in Trans. Linn. Soc. III, 262. A bush or small scraggy tree with thin, striate, 4-angled branches: the young parts glabrous or sericeous. *Leaves* coriaceous, narrowly oblanceolate to oblanceolate, obtuse, often with a deciduous point, subsessile; when dry distinctly dotted beneath and obscurely 3-nerved, glabrous or silky on the midrib beneath and on the edges, from $\frac{1}{4}$ to 1 in. long and $\frac{1}{16}$ to $\frac{3}{16}$ in. broad. *Flowers* sessile or sub-sessile, about $\frac{1}{5}$ or $\frac{1}{6}$ in. in diam. (when dry). *Calyx-tube* glabrous or sericeous. *Capsule* much depressed, surrounded by the calyx-tube, glabrous or hairy, 5-ridged, pitted, opening by 5 valves, $\frac{1}{25}$ to $\frac{1}{30}$ in. in diam. (when dry). DC. Prod. III, 227; Hook. fil. Fl. Tasm. I, 139; Benth. Fl. Austral. III, 104.

This species is common and widely distributed in Australia and has several well-marked varieties of which two occur in our region.

VAR. commune, Benth. Fl. Austral. III, 104. Young branches leaves and calyx-tube glabrous or glabrescent. *Leaves* narrowly oblong or linear-lanceolate, $\frac{1}{16}$ to $\frac{1}{15}$ in. broad. *L. flavescens*, Bot. Mag. t. 2695. *L. amboinensis*, Blume Bijdr. 1100: Mus. Bot. Lugd. Bat. I, 68; DC. Prod. III, 229; Miq. Fl. Ind. Bat. I, Pt. 1, 404; Duthie in Hook. fil. Fl. Br. Ind. II, 464. *L. polygalifolium*, Salisb. Prod. 350; *L. Thea*, Willd. Spec. Pl. II, 949. *L. porophyllum*, Cav. Ic. IV, 17, t. 330, fig. 2. *Macklottia amboinensis*, Korth. in Ned. Kruidk. Arch. I, 196. *Myrtus amboinensis*, Rumph. Herb. Amb. II, 77, t. 18.

MALACCA (on Mount Ophir); *Griffith* (K.D. 2339); *Lobb*, *Stolickza*, *Maingay* (K.D.) 713. KEDAH, *Ridley* 5349. DISTRIB.—Bangka, Amboina, Moluccas, Borneo, Australia.

VAR. *javanica*. Young branches densely sericeous; *calyx-tube* glabrescent, occasionally very sericeous. *Leaves* obovate-lanceolate, broadly obtuse, with long silky hairs on the margins and on the midrib beneath. *Flowers* often crowded. *L. javanicum*, Blume Bijdr. 1100; Mus. Bot. Lugd. Bat. I, 68; DC. Prod. III, 229: Duthie in Hook. fil. Fl. Br. Ind. II, 464. *L. floribundum*, Jungh. Java I, 578; Nat. en Geneesk. Arch. Ned. Ind. II, 370; Miq. Fl. Ind. Bat. I, Pt. 1, 404. *Macklottia javanica*, Korth. Ned. Kruidk. Arch. 196.

MALACCA: *Griffith*. PERAK: *Wray* 330, 885, 3839: *Scortechini* 754: *King's Collector* 7426, 7435. DISTRIB.—Sumatra, Java, Celebes, Borneo. Burmah (a single specimen) at Moulmein; *Lobb*. This variety is much commoner in the Peninsula than the former.

3. MELALEUCA, Linn.

Trees or shrubs. *Leaves* alternate, rarely opposite, entire, lanceolate or linear, flat or subterete, 1–3–many-nerved. *Flowers* in heads or spikes, each sessile in the axil of a floral leaf, 5-merous; bracts deciduous. *Calyx-tube* subglobose; lobes 5, imbricate or open, deciduous or persistent. *Petals* 5, spreading, deciduous. *Stamens* numerous, more or less united at their bases into 5 bundles opposite the petals; anthers versatile, the cells parallel and bursting longitudinally. *Ovary* inferior or half-inferior, enclosed in the tube of the calyx; style filiform, stigma small; ovules numerous. *Capsule* included in the calyx, dehiscing loculicidally by 3 valves. Perfect *seeds* cuneate: embryo straight, longer than the radicle. DISTRIB.—Species about 130, almost all Australian, but one scattered in Asia.

MELALEUCA LEUCADENDRON, Linn. Mant. 105. A tree often of considerable size; the bark pale, thick, peeling off in papery layers. Branches usually pendulous, slender. *Leaves* coriaceous, alternate, narrowly oblong-elliptic, oblique or falcate, acuminate acute or obtuse, narrowed below into a short petiole, with 3 to 5 or 7 vertical unanastomosing nerves; when young adpressed-hairy, when old glabrous: length 1·5 to 5 in.; breadth ·2 to 1 in. *Spikes* 2 to 6 in. long; sometimes interrupted, solitary, at first terminal but subsequently surmounted by a leaf-axis, the rachis and calices glabrous or hairy: *calyx-tube* ovoid, the lobes orbicular. *Petals* ·1 to ·15 in. in diam. *Staminal* bundles under ·5 in. long. *Fruit* about ·2 in. in diam. Benth. Fl. Austral. III, 142: Kurz in Journ. As. Soc. Beng. XLVI, Pt. 2, 61; Fl. Br. Burm. I, 472; Duthie in Hook. fil. Fl. Br. Ind. II, 465.

MALACCA: *Singapore*. DISTRIB.—Malayan Archipelago, British India, Australia.

The following two varieties have been distinguished by Mr. Duthie in Hooker's *Flora of British India*.

VAR. *Leucadendron*; spikes glabrous. Linn. Mant. 105 and Suppl. 342; Lour. Fl. Cochinch. 468; Roxb. Fl. Ind. III, 397; DC. Prodr. III, 212; Wall. Cat. 3646; Blume Mus. Bot. I, 66; Miq. Fl. Ind. Bat. I, pt. 1, 401. *Myrtus Leucadendron*, Linn.—Rumph. Herb. Amb. II, 72, tt. 16, 17, f. 1.—Cultivated in India.

VAR. *minor*; spikes villous. *M. minor*, Sm. in Rees. Cycl. 23; DC. Prodr. III, 212; Wall. Cat. 3645; Blume Mus. Bot. I, 67; Miq. Fl. Ind. Bat. I, Pt. 1, 403. *M. Cajuputi*, Roxb. Fl. Ind. III, 394; W. & A. Prodr. 326; Miq. l.c. 403. *M. Leucadendron*, Lam. Encycl. 641. *M. viridiflora*, Gærtn. Fruct. I, 173, t. 35; DC. Prodr. l.c.; Wall. Cat. 3647. *M. saligna*, Blume Mus. Bot. I, 66. *M. Cumingiana* and *lanceifolia*, Turcz. in Bull. Soc. Mosc. xx. 164. *M. saligna*, Gmel. Syst. 793.—Rumph. Herb. Amb. II, 76.—This appears to be the plant from which the Cajuput-oil of commerce is chiefly obtained.

4. TRISTANIA, R. Br.

Tall shrubs or trees. *Leaves* alternate or crowded at the summit of the branches, rarely opposite, coriaceous, glabrous. *Flowers* small, yellow or white, in pedunculate axillary cymes; bracts deciduous or 0. *Calyx-tube* turbinate-campanulate or open, attached below to the ovary; lobes 5, short, persistent. *Petals* 5, imbricate, spreading. *Stamens* numerous, shorter than the petals, usually united in 5 bundles and opposite to them; anthers versatile, cells parallel and opening longitudinally. *Ovary* inferior or $\frac{1}{2}$ -superior, the apex flat or convex; 3-celled; ovules many in each cell, suspended or horizontal. *Capsule* loculicidally 3-valved. Perfect *seeds* few, linear, cuneate, or winged at the upper part; embryo straight, cotyledons broad, longer than the radicle. DISTRIB.—About 22 species inhabiting the Malay peninsula and islands, New Caledonia, and Australia.

Leaves sessile, sub-auriculate 1. *T. subauriculata*.

Leaves narrowed into a short petiole.

Cymes (with their peduncles) much shorter than the leaves.

Leaves oblanceolate or obovate-oblong; capsules globular.

Petals transversely oblong, entire, shortly clawed;

capsules '4 to '5 in. in diam. 2. *T. merguensis*.

Petals sub-rotund, subentire, hairy; capsules '35 in. in diam. 3. *T. Maingayi*.

Leaves obovate; capsule oblong, '2 in. long; petals sub-

rotund, their margins serrate 4. *T. obovata*.

Cymes (with their peduncles) longer than the leaves ... 5. *T. Whiteana*.

1. *TRISTANIA SUBAURICULATA*, n. sp. King. A tree 10 to 40 feet high: the young branches pale (when dry) puberulous or glabrescent. *Leaves* very coriaceous, sessile, obovate-oblong, the apex broad, blunt, emarginate or slightly pointed, gradually narrowed to the slightly-auricled base: both surfaces glabrous, pale when dry, the upper shining, the lower paler, dull, obscurely glandular: main-nerves spreading, not prominent, .2 in. apart, length 2.5 to 6 in.; breadth 1.5 to 2.5 in. *Cymes* axillary, few-flowered, much shorter than the leaves, dichotomous: the peduncles .3 to .8 in. long, compressed, clothed, especially above, with white silky hairs. *Flowers* .25 in. across. *Calyx-tube* tubular-campanulate, densely pubescent below externally, the teeth broadly triangular, blunt, short. *Petals* rounded, entire, glabrous. *Stamens* in 5 groups of 10 each. *Ovary* depressed-globular, glabrous. *Capsule* sub-globular, glabrous, half-enveloped by the calyx, .25 in. in diam. *Seeds* compressed, about 8 in each cell.

PERAK: *King's Collector* 7047, 8253.

This is allied to *T. merguensis*, but has broader leaves of much thicker texture and sessile; shorter fewer-flowered cymes, and smaller flowers and fruit.

2. *TRISTANIA MERGUENSIS*, Griff. in Journ. As. Soc. Beng. for 1854, p. 637. A tree. Young branches stout with pale bark when dry; the youngest puberulous. *Leaves* obovate-lanceolate, obtuse or obtusely acuminate, narrowed to the very short or almost obsolete petiole; main-nerves ascending, distinct, .1 in. apart; both surfaces glabrous, the lower dull, paler and obscurely glandular, the upper shining; length 3.5 to 7 in.; breadth 1.15 to 2 in.; petiole .1 to .2 in. *Cymes* on angular peduncles .5 to 1.5 in. long, slightly supra-axillary, shorter than the leaves, dichotomous, hoary-pubescent, especially towards the apex. *Flowers* densely crowded at the ends of the branchlets, .25 in. in diam. *Calyx-tube* densely clothed with white pubescence on both surfaces, broadly cupular, tapered to the very short almost obsolete pedicel, the teeth broad, rounded. *Petals* small, transversely oblong, shortly clawed. *Ovary* pilose. *Capsule* sub-globular, large (.4 in. in diam.), glabrous, half-enveloped by the calyx; its valves broad, blunt. *Seeds* compressed, about 8 in each cell. Kurz, For. Fl. Burm. I, 473. "*Tristania affinis*," Griff. Notul. 650: Ic. Pl. Asiat. t. 636, f. 3. *Melaleuca eugenifolia*, Wall. Cat. 3648. *M. decurrens*, Wall. Cat. 3649.

MALACCA: *Finlayson, Harvey*. PERAK: *Wray* 2921, 4124; *Scortechini* 1021. PAHANG: *Ridley* 1062: growing at elevations of several thousand feet. **DISTRIB.**—Burma, Borneo.

3. *TRISTANIA MAINGAYI*, Duthie in Hook. fil. Fl. Br. Ind. II, 467. A tree: young branches with brown bark (when dry) and covered with deciduous white hairs. *Leaves* narrowly oblong-oblanceolate acute, much

narrowed to the short petiole; main-nerves spreading, less than .1 in. apart, not conspicuous; lower surface dull and glandular, slightly paler than the shining upper: length 1.75 to 3.5 in.; breadth .5 to 1.25 in.; petiole .1 to .2 in. *Cymes* on angular peduncles .5 to 1.25 in. long, axillary, shorter than the leaves, dichotomous, hoary; the flowers few, crowded, .3 in. in diam., on very short pedicels. *Calyx-tube* broadly cup-shaped, tapered to the base; the teeth shallow, broad, sub-acute. *Petals* small, sub-rotund, sub-entire, hairy outside. *Ovary* pubescent. *Capsule* large (.35 in. in diam.) sub-globular, glabrous, enclosed in the calyx except at the apex; its valves broad, blunt. *Seeds* winged, 9 or 10 in each cell.

PENANG : *Maingay* (K.D. 769) ; *Curtis*, 238, 438.

I keep up this species with much hesitation. It appears to me to be a form of *T. merguensis* with leaves and capsules smaller than usual.

4. *TRISTANIA OBOVATA*, R. Br. in Benn. and Horsf. Fl. Jav. 127, t. 27. A large shrub: the young branches reddish-brown, rusty puberulous. *Leaves* obovate, much contracted to the short petiole, the apex rounded or retuse; both surfaces glabrous, the lower glandular and paler: main-nerves spreading, about .1 in. apart; length 1.5 to 2.5 in.; breadth .6 to 1.2 in.; petiole .2 to .4 in. *Cymes* extra-axillary and terminal, few-flowered, puberulous or glabrous, much shorter than the leaves. *Flowers* .15 in. long, on pedicels shorter than themselves, often in pairs. *Calyx-tube* turbinate; the teeth rounded, short. *Petals* sub-rotund with serrate margins. *Ovary* silky. *Capsule* .2 in. long, oval, glabrous, much longer than the persistent calyx: its valves broad, blunt. Miq. Fl. Ind. Bat. I, Pt. 1, 397.

SINGAPORE : *Ridley* 5886.

5. *TRISTANIA WHITEANA*, Griff. Pl. Cantor. 18. A shrub, the young bark brown. *Leaves* oblanceolate, bluntly acuminate, much narrowed to the short petiole; both surfaces shining, the lower pellucid-punctate, pale: main-nerves numerous (about .05 in. apart), sub-horizontal; length 3 to 5.5 in.; breadth .75 to 1.75 in.; petiole .25 to .5 in. *Cymes* on peduncles nearly as long as the leaves, corymbosely paniculate, minutely pubescent, axillary and terminal, the bracts few and leaflike; bracteoles small caducous. *Flowers* numerous, on pedicels shorter than themselves, .1 in. across. *Calyx-tube* obconic, densely pubescent on both surfaces, its teeth obsolete. *Petals* orbicular, glandular. *Capsule* under .1 in. in diam., free from the calyx except at the base. *T. Wightiana*, Duthie in Hook. fil. Fl. Br. Ind. II, 466. *T. sumatrana*, Miq. Fl. Ind. Bat. Suppl. 308. *Hypericinea pimentifolia*, Wall. Cat. 4828.

MALACCA: *Griffith* (K.D. 2340). SINGAPORE: *Wallich*, *Lobb*.
PENANG: *Walker* 62. DISTRIB.—Sumatra, Java, Borneo.

NOTE.

In Hooker's *Flora of British India* *T. burmannica*, Griff. is said to have been collected at Malacca. I find however no specimens from that locality in either the Kew or the Calcutta Herbarium; and I therefore omit it here.

5. RHODAMNIA, Jack.

Shrubs or small trees. *Leaves* opposite, 3-nerved, hoary or pubescent beneath. *Flowers* rather small, pedicels short, sometimes shortly fasciculate or in short lax racemes; bracteoles small, deciduous. *Calyx-tube* ovoid or subglobose, not produced beyond the ovary; segments 4, persistent. *Petals* 4, spreading. *Stamens* numerous, in several series, free; filaments filiform; anthers versatile with parallel cells dehiscing longitudinally. *Ovary* 1-celled with parietal placentas and many ovules; style filiform, stigma peltate. *Berry* globose, crowned with the limb of the calyx. *Seeds* few, reniform, globose or variously compressed, testa hard; embryo horseshoe-shaped, radicle long, cotyledons very short. DISTRIB.—About 6 species; Australia, and Tropical Asia.

RHODAMNIA TRINERVIA, Blume Mus. Bot. Lugd. Bat. I, 79. A small tree or a shrub: young parts and inflorescence often silky. *Leaves* ovate-oblong or oblong-lanceolate, acuminate, 3-nerved; upper surface glabrous, reticulate; the lower glabrous or silvery pubescent; length 1·75 to 4·5 in.; breadth ·75 to 2 in.; petiole ·2 to ·35 in. *Peduncles* varying in length but always much shorter than the leaves, axillary, 1- rarely 3-flowered, minutely bracteolate near the calyx. *Fruit* globose, reddish, ·2 to ·3 in. in diam. Kurz in Journ. As. Soc. Beng. XLVI, Pt. 2, 63; For. Fl. Br. Burma I, 474: Benth. Fl. Austral. III, 278; Duthie in Hook. fil. Fl. Br. Ind. II, 468. *Myrtus trinervia*, Sm. in Trans. Linn. Soc. III, 280. *Eugenia?* *trinervia*, DC. Prod. III, 279: Bot. Mag. 3223.

In all the Provinces except the Andaman Islands; common. DISTRIB.—The Malayan Archipelago and Philippines to Australia, Burma.

VAR. *concolor*; leaves green on both surfaces, sparingly pubescent, peduncles 4-7- or fewer-flowered. *R. cinerea*, Griff. Notul. 653, not of Jack.; Kurz in Journ. As. Soc. *l.c.* *R. concolor*, Miq. Fl. Ind. Bat. Suppl. I, 315. *Myrtus smilacifolia*, Wall. Cat. 3629.

VAR. *spectabilis*; leaves silvery-white beneath or greyish when old, flowers usually fewer, 2 or solitary. *R. spectabilis*, Blume Mus. Bot. I, 78; Miq. Fl. Ind. Bat. I, Pt. 1, 479; Kurz *l.c.* *R. cinerea*, Jack. in Mal. Misc. *Monoxora spectabilis*, Wight Ill. II, 12, t. 97, f. 5,

R. Nageli, Miq. Fl. Ind. Bat. I, Pt. 1, 478. *R. subtriflora* and *R. Mulleri*, Bl. l.c. 79.

This species, being widely distributed, presents many forms several of which have been described as species. The above arrangement of these forms into two varieties was first suggested by Kurz.

6. RHODOMYRTUS, DC.

Small trees or tomentose shrubs. *Leaves* opposite, 3-nerved. *Flowers* rather large, axillary. *Calyx-tube* turbinate, oblong or sub-globose, slightly produced above the ovary; lobes 5, rarely 4, herbaceous, persistent. *Petals* 5, rarely 4, spreading. *Stamens* indefinite, free, in many series. *Ovary* 1-2-3-celled with spurious partitions, or divided into numerous 1-ovuled superposed cells; style filiform, stigma capitate. *Berry* globose or ovoid, with few or numerous seeds not distinctly superposed in rows. *Seeds* compressed, reniform or nearly orbicular, horizontal, testa hard; embryo curved or spiral, radicle very long, cotyledons small. **DISTRIB.**—5 species, four of them inhabitants of E. Australia, and one widely distributed over Tropical Asia, especially throughout the Indian Archipelago, as far as China.

RHODOMYRTUS TOMENTOSA, Wight Spicil. Neilgh. I, 60, t. 71. A shrub 4 to 8 feet high: young parts tomentose. *Leaves* the lower ternate, the upper opposite, elliptic to obovate, obtuse, sometimes mucronate, 3-nerved, the under surface covered with soft white tomentum, the upper glabrous: length 1·5 to 2·5 in.; breadth ·65 to 1 in.; petiole ·1 to ·15 in. *Peduncles* axillary shorter than the leaves, 1-3-flowered, bracteolate close to the calyx. *Flowers* ·5 to ·75 in. across. *Calyx* tomentose, with 5 unequal lobes. *Petals* downy, shortly clawed. *Berry* about the size of a cherry, oval or sub-globose, dark-purple: pulp abundant, sweet. *Seeds* compressed, forming 2 rows in each cell. Miq. Fl. Ind. Bat. I, Pt. 1, 477; Benth. Fl. Hongk. 121; Duthie in Hook. fil. Fl. Br. Ind. II, 469; Trimen Fl. Ceylon. II, 166. *Myrtus tomentosa*, Ait.; DC. Prodr. III, 240; Vahl Symb. II, 56; Blume Bijdr. 1081; W. & A. Prodr. I, 328; Wight Ill. II, 12, t. 97, f. 3, Ic. 522; Roxb. Fl. Ind. II, 498; Wall. Cat. 3630; Korth. in Ned. Kruidk. Arch. I, 197. *M. canescens*, Lour. Fl. Cochinc. I, 311.

PENANG, MALACCA, PERAK. **DISTRIB.**—Malayan Archipelago. Hills of Southern British India and Ceylon.

7. DECASPERMUM, Forst.

Shrubs or small trees. *Leaves* opposite, pinnate-nerved. *Flowers* small, in axillary racemes, or in terminal leafy panicles, occasionally polygamous. *Calyx-tube* campanulate, slightly or not at all produced

above the ovary; lobes 4 or 5, spreading. *Petals* 4 or 5, spreading. *Stamens* numerous in several series, free, filaments filiform; anthers small, versatile, with parallel cells opening longitudinally. *Ovary* 4- or 5-celled with 2 or very few ovules in each cell; cells often divided by spurious dissepiments; style filiform, stigma peltate. *Berry* globose, crowned by the calyx-lobes. *Seeds* 8 to 10, reniform-sub-globose, testa hard; embryo horse-shoe-shaped or circular, with long radicle and short cotyledons. **DISTRIB**—About 4 species in tropical Asia, Australia, and the Pacific Islands.

DECASPERMUM PANICULATUM, Kurz in Journ. As. Soc. Beng. XLVI, Pt. 2, 61: For. Flora. Br. Burma I, 475. A small tree, often 30 feet high. Young parts and inflorescence minutely sericeous-tomentose. *Leaves* membranous or thinly coriaceous, oblong-lanceolate or ovate-lanceolate, acuminate, the base often narrowed, edges entire; main-nerves about 10 pairs, spreading, not prominent; upper surface glabrous: the lower paler and reddish, glandular, midrib always pubescent on the lower and always on the upper; length 1·25 to 3·5 in.; breadth ·4 to 1 in.; petiole ·1 to ·3 in. *Panicles* axillary and shorter than the leaves, or terminal and longer than the leaves; bracts small and deciduous, or leaf-like and permanent. *Flowers* ·2 to ·3 in. in diam., often polygamous. *Petals* white, pubescent inside. *Calyx-tube* more or less clothed with white hairs; the lobes roundish or sub-acute, hairy or glabrous. *Style* exserted. *Berry* globose, about ·1 in. in diam. Duthie in Hook. fil. Fl. Br. Ind. I, 470. *Nelitris paniculata*, Lindl. Collect. Bot. under 16; DC. Prod. III, 231; Wall. Cat. 3627; Wight III. II, t. 97, fig. 10. Icon. 521; Benth. Fl. Austral. III, 279. *N. polygama*, Spreng. Syst. II, 488; Korth. in Ned. Kruidk. Arch. I, 197. *N. pallescens*, Miq. Fl. Ind. Bat. Suppl. 314. *Eugenia polygama*, Roxb. Hort. Beng. 92; Fl. Br. Ind. II, 491. *E. cuspidata*, Wall. Cat. 3627. *Memecylon acuminatum*, Wall. Cat. 4105; *Syzygium vimineum*, Wall. Cat. 3593 B. *Hiræa Finlaysoniana*, Wall. Cat. 3566 F.

In all the provinces except the Andaman and Nicobar Islands: common. **DISTRIB.**—Malayan Archipelago, Burma, Khasia Hills, Sikkim Terai.

Various other forms to which specific names have been given appear to me to be reducible here. The Wallichian examples in Herb. Calcutta of Wall. Cat. 3593 B and 4105 belong in my opinion to this species.

VAR. *Finlaysoniana*, Duthie l.c.; leaves sub-coriaceous, panicles shorter than the leaves, few-flowered, calyx densely tomentose, its lobes rounded: stamens nearly equalling the petals. *N. polymorpha*, Blume Mus. Bot. Lugd. Bat. I, 75, t. LX. *Hiræa Finlaysoniana*, Wall. Cat. 7363.

8. EUGENIA, Linn.

Trees or shrubs, smooth or rarely tomentose or setose. *Leaves* opposite rarely alternate, coriaceous or membranous, pinnate-nerved. *Inflorescence* centripetal with solitary axillary flowers, or in short racemes or centrifugal in dense terminal or axillary cymes or in terminal or lateral trichotomous panicles. *Bracts* usually small and deciduous. *Calyx-tube* globose or more or less elongate, 4- or 5-lobed or sub-truncate. *Petals* 4 or 5, free and spreading or connivent calyptrate and caducous. *Disc* lining the calyx-tube, stamiferous at the edge. *Stamens* numerous, in many rows, usually combined in 4 or 5 bundles; filaments slender; anthers small, versatile, dehiscing longitudinally. *Ovary* inferior, 2- rarely 3-celled; ovules many in each cell; style filiform, stigma small. *Fruit* inferior, crowned by the remains of the calyx, pulpy, rarely dry. *Seeds* few, oblong or globose, often compressed, testa membranous or cartilaginous, albumen none or very scanty; embryo thick, fleshy. **DISTRIB.**—About 650 species chiefly in tropical America and Asia; a few in tropical Africa and Australia.

Sect. I. JAMBOSA. Flowers usually 4-merous, often large. *Calyx* clavate, funnel-shaped or sub-globose, its staminal disc often thickened and its mouth with 4-persistent often thickened lobes crowning the fruit. *Petals* free, *Berry* pulpy; seeds large.

Leaves large—

Leaves with their main nerves under 20 pairs, bold, the reticulations inconspicuous, mostly from 8 to 14 in. long (except in Nos. 8, 9 and 10)—

Flowers 1 inch or more across—

- | | | |
|---|---|----------------------------|
| Leaves on very short inconspicuous petioles, auricled | { | 1. <i>E. formosa</i> . |
| at the cordate base, often amplexicaul | | 2. <i>E. Perakensis</i> . |
| | | 3. <i>E. javanica</i> . |
| Leaves neither cordate nor amplexicaul but narrowed | { | 4. <i>E. Jambos</i> . |
| at the base | | 5. <i>E. malaccensis</i> . |

Flowers half an inch or at most three quarters of an inch across—

Leaves glabrous—

- | | | |
|---|---|-------------------------------|
| Young branches sub-terete or compressed ... | { | 6. <i>E. pseudo-formosa</i> . |
| | | 7. <i>E. papillosa</i> . |
| | | 8. <i>E. densiflora</i> . |
| | | 9. <i>E. plumbea</i> . |
| Young branches 4-angled | { | 10. <i>E. Scortechinii</i> . |
| | | 11. <i>E. mollis</i> . |

Leaves hairy beneath; flowers in terminal panicles

Leaves 8 to 16 in. long, with very numerous (more than 20 pairs) of bold distinct sub-horizontal main nerves; flowers half an inch or more in diameter—

- | | | |
|---|---|-------------------------------|
| Reticulations of leaves distinct | { | 12. <i>E. quadrata</i> . |
| | | 13. <i>E. scalarinervis</i> . |
| | | 14. <i>E. pergamentacea</i> . |

- Reticulations of leaves faint { 15. *E. Dyeriana*.
 16. *E. Hemsleyana*.

Leaves small—

Leaves 2·5 to 8 in. long (longer in No. 19)

Flowers in terminal spreading panicles—

- Leaves obovate, oblanceolate, or broadly elliptic ... { 17. *E. pachyphylla*.
 18. *E. lepidocarpa*.
 19. *E. garcinifolia*.
 20. *E. crenulata*.

- Leaves oblong, ovate or elliptic, tapering slightly { 21. *E. grandis*.
 22. *E. Thumra*.
 at each end { 23. *E. Griffithii*.
 24. *E. Clarkeana*.
 25. *E. corrugata*.

Leaves ovate-lanceolate or narrowly elliptic (sometimes broadly elliptic in *E. pyrifolia*) much narrowed to each end, the apices sometimes caudate-acuminate—

- Flower-buds clavate { 26. *E. pendens*.
 27. *E. Burkilliana*.
 28. *E. Helferi*.
 29. *E. Kurzii*, VAR. *andamanica*.
 30. *E. anisosepala*.
 31. *E. Gageana*.
 32. *E. Hullettiana*.
 33. *E. chlorantha*.
 34. *E. penangiana*.
 35. *E. Ridleyi*.
 Flower-buds globular, not clavate { 36. *E. pyrifolia*.
 37. *E. lineata*.
 38. *E. cymosa*.

Flowers in small axillary or terminal racemes or in lax racemose few-flowered panicles—

- Flower buds globular or slightly elongated ... { 39. *E. conglomerata*.
 40. *E. urceolata*.
 41. *E. glauca*.
 42. *E. subrufa*.
 43. *E. Duthieana*.
 44. *E. polyantha*.
 45. *E. Manii*.
 46. *E. caudata*.
 Flower-buds and flowers much elongated ... { 47. *E. filiformis*.
 48. *E. andamanica*.

Flowers in dense short terminal or axillary glomeruli or cymes—

Flowers not conspicuously bracteolate—

- Flower-buds globular 49. *E. Hoseana*.

- | | | | | | | |
|--|-----|-----|-----|-----|-----|-----------------------------|
| Flower-buds much elongated | ... | ... | ... | ... | ... | 50. <i>E. Benjamina</i> . |
| | | | | | | 51. <i>E. variolosa</i> . |
| | | | | | | 52. <i>E. claviflora</i> . |
| | | | | | | 53. <i>E. zeylanica</i> . |
| | | | | | | 54. <i>E. grata</i> . |
| | | | | | | 55. <i>E. tecta</i> . |
| Flowers in conspicuously bracteolate dense clusters, | | | | | | 56. <i>E. pseudo-tetra-</i> |
| branches 4-angled | ... | ... | ... | ... | ... | <i>ptera</i> . |
| | | | | | | 57. <i>E. polita</i> . |

Sect. II. SYZYGIIUM. Flowers 4- or 5-merous, usually small: the calyx obovoid, turbinate or clavate, its staminal disc rarely thickened, the mouth 4- or 5-toothed or lobed or sub-entire. *Petals* more or less connate, much imbricate and calyptately deciduous. *Berries* small, sub-globose or oblong, often with little pulp.

Flowers panicled, their buds 2 in. or more in length (less in *E. nigricans* and *E. expansa*), clavate, always narrowed into a long pseudo-stalk—

Leaves more than 2 inches long—

Main-nerves of leaves under 25 pairs, distinct—

- | | | | | | | |
|--|-----|-----|-----|-----|-----|------------------------------|
| Panicles large, lax, spreading, mostly terminal | ... | ... | ... | ... | ... | 58. <i>E. valdevenosa</i> . |
| | | | | | | 59. <i>E. oblongifolia</i> . |
| | | | | | | 60. <i>E. sub-hori-</i> |
| | | | | | | <i>zontalis</i> . |
| Panicles short, both axillary and terminal | ... | ... | ... | ... | ... | 61. <i>E. Valettoniana</i> . |
| | | | | | | 62. <i>E. expansa</i> . |
| | | | | | | 63. <i>E. chloroleuca</i> . |
| Nerves of leaves very numerous, close together and | | | | | | 64. <i>E. nigricans</i> . |
| equally distinct or often all obscure | ... | ... | ... | ... | ... | 65. <i>E. inophylla</i> . |
| | | | | | | 66. <i>E. oblata</i> . |
| | | | | | | 67. <i>E. Bernardi</i> . |
| | | | | | | 68. <i>E. Prainiana</i> . |
| | | | | | | 69. <i>E. Pearsoniana</i> . |
| | | | | | | 70. <i>E. lævicaulis</i> . |
| | | | | | | 71. <i>E. Goodenovii</i> . |

Leaves 2 inches or less in length, rarely as much as 2.5 in.—

Glabrous—

- | | | | | | | |
|------------------------------|-----|-----|-----|-----|-----|--------------------------------|
| Fruit oblong | ... | ... | ... | ... | ... | 72. <i>E. linocierioidea</i> . |
| Fruit globose or sub-globose | ... | ... | ... | ... | ... | 73. <i>E. myrtifolia</i> . |
| | | | | | | 74. <i>E. Stapfiana</i> . |
| | | | | | | 75. <i>E. Wrayi</i> . |
| Setose | ... | ... | ... | ... | ... | 76. <i>E. setosa</i> . |

Flowers numerous, less than 2 in. long, in terminal or axillary panicles, oblong or clavate, tapered gradually to the base, rarely narrowed into a short pseudo-stalk, all without a true pedicel except sometimes the terminal ones of the branchlets.

- | | | | | | | |
|----------------------------|-----|-----|-----|-----|-----|------------------------------|
| Leaves obtuse or sub-acute | ... | ... | ... | ... | ... | 77. <i>E. inasensis</i> . |
| | | | | | | 78. <i>E. subdecussata</i> . |
| | | | | | | 79. <i>E. punctulata</i> . |

Leaves obtuse or sub-acute...	...	...	...	...	80. <i>E. bracteolata</i> .
					81. <i>E. venulosa</i> .
					82. <i>E. pseudo-subtilis</i> .
					83. <i>E. microcalyx</i> .
					84. <i>E. scoparia</i> .
Leaves more or less acuminate	...	...	...	...	85. <i>E. myriantha</i> .
					86. <i>E. verecunda</i> .
					87. <i>E. pseudo-subtilis</i>
					VAR. <i>sub-acuminata</i> .
					88. <i>E. Swettenhamiana</i> .
					89. <i>E. acuminatissima</i> .
					90. <i>E. Kunstleri</i> .
					91. <i>E. pustulata</i> .
					92. <i>E. Koordersiana</i> .
					93. <i>E. simulans</i> .
					94. <i>E. Curtisii</i> .

Flowers small, numerous, in short much-branched spreading cymose panicles mostly from the scars of fallen leaves, globular or nearly so, narrowed gradually to the base or abruptly contracted into a short pseudo-stalk,

1. *EUGENIA FORMOSA*, Wall. Pl. As. Rar. II. 6, t. 108: Wall. Cat. (in part) 3609. A tree, 20 to 30 feet high: young branches almost terete, with pale bark. *Leaves* coriaceous, ovate-oblong to lanceolate-oblong, much tapered to the acute apex, sometimes in threes; the base rounded, slightly cordate; upper surface pale, olivaceous (when dry), the lower paler; both quite smooth; main-nerves 12 to 20 pairs, rather strong, ascending, rather straight, interarching '2 to '3 in. from the edge; length 8 to 12 occasionally to 18 in.; breadth 3 to 5 in.; petiole about '2 in. *Flowers* about 2 in. across (excluding the stamens), pale rose-coloured, on pedicels '3 to '5 in. long, bracteolate near the apex, in fascicles of three (occasionally solitary), usually from the branches below the leaves but sometimes terminal. *Calyx-tube* '6 to '75 in. long, clavate-turbinate, smooth; the 4 lobes broad, rounded, unequal, '5 in. broad and about half as long. *Petals* '5 in. long, almost orbicular. *Filaments* more than 1 in. long, very numerous, spreading. *Fruit* as large as a small apple, globose, contracted towards the base, crowned at the apex by the spreading calyx-lobes, white, smooth, 2-seeded, the pulp rather scanty. Duthie in Hook. fil. Fl. Br. Ind. II, 471; Kurz in Journ. As. Soc. Beng. XLVI, Pt. 2, 68; For. Fl. Brit. Burm. I, 492; Wight Ill. II, 14. *Jambosa formosa*, Walp. Rep. Bot. II, 191; Blume Mus. Bot. I, 92; Miq. Fl. Ind. Bat. I, Pt. 1, 412. *J. mappacea*, Korth. in Ned. Kruidk. Arch. I, 200. *E. somarangensis*, DC. Prod. III, 286.

PERAK: King's Collector 6254; *Scortechini*.

Only a few specimens of this are to be found from our area in the Herbaria at Kew and Calcutta, and they have all oblong-lanceolate leaves. In British India the form with ovate-oblong leaves is the commoner.

2. *EUGENIA PERAKENSIS*, King n. sp. A glabrous tree, 50 to 70 feet high: young branches as thick as a swan-quill, brown when dry. *Leaves* coriaceous, oblong-elliptic, the apex sub-acute, narrowed gradually to the cordate, slightly oblique base; upper surface olivaceous when dry, the lower pale-brown; main-nerves 12 to 14 pairs, ascending, curving a little and interarching .2 to .4 in. from the edge, very prominent on the lower surface, faint on the upper; intermediate nerves and reticulations slender but distinct; length 12 to 18 in.; breadth 5 to 8 in.; petiole 3 in. very stout. *Flowers* 1 in. or more across, in fascicles of 6 to 8 from depressed tubercles on the smaller branches, on peduncles .5 in. long. *Calyx-tube* campanulate, .5 in. long, contracted into a pseudo-stalk at its junction with the peduncle: the mouth with 4 broad, rounded lobes less than 1 in. long. *Petals* orbicular, longer than the calyx-lobes. *Fruit* unknown.

PERAK: *King's Collector* 5595.

A species only once collected and the specimens have no fruit; somewhat resembling *E. macrocarpa*, Roxb., but with smaller flowers and larger leaves.

3. *EUGENIA JAVANICA*, Lamk. Dict. III, 200. A glabrous tree, 25 to 35 feet high: young branches terete, pale-brown. *Leaves* thinly coriaceous, elliptic-oblong, elliptic-lanceolate or elliptic, the apex acute or subacute, slightly narrowed to the rounded (sometimes slightly cordate) base; both surfaces pale-brown when dry: main-nerves slightly conspicuous on the lower surface, 8 to 12 pairs, slightly curved, spreading, interarching about .1 in. from the edge; length 4 to 8 in.; breadth 1.75 to 3.5 in.; petiole .1 to .2 in. *Flowers* 1 in. or slightly more in diam. (excluding the stamens) white, in axillary or terminal lax pedunculate few-flowered corymbose racemes: peduncle of racemes from 1 to 1.25 in. in length; pedicels of flowers .4 to .6 in. long. *Calyx-tube* clavate-turbinate, smooth, .35 to .5 in. long, tapering into a short pseudo-stalk, the 4 lobes broad, unequal, rounded, blunt, concave. *Petals* obovate-orbicular, larger than the sepals. *Filaments* slender, about .75 in. long. *Fruit* when quite ripe depressed-turbinate, about 1.5 in. long and 2 in. broad at the apex, pale-yellowish, 1- or few-seeded, the endocarp spongy. Duthie in Hook. fil. Fl. Br. Ind. II, 474; Kurz in Journ. As. Soc. Beng. XLVI, (1877), Pt. 2, 69; For. Fl. Brit. Burm. I, 494. *E. alba*, Roxb. Hort. Beng. 39; Fl. Ind. II, 493; Wall. Cat. 3612A, 3614 all the numbers. *Jambosa alba*, Rumph. Herb. Amb. I, 127, t. 39; W. & A. Prodr. I, 332; Wight Ill. II, 14; Ic. t. 548; Miq. Fl. Ind. Bat. I, Pt. 1, 443 (*in part*). *J. samarangensis*, Korth. in Ned. Kruidk. Arch. I, 201; Blume Mus. Bot. I, 95. *Jambosa macrophylla*, DC. Prod. III. 286 (*in part*). *Myrtus samarangensis*, Blume Bijdr. 1084. *Jambosa insignis*, Bl. Mus. Bot. I, 100. *Jambosa ambigua*, Bl. Mus. Bot. I, 96.

MALACCA: *Griffith* 2352, *Maingay* 748, *Hervey*. SINGAPORE: *Ridley* 8931. ANDAMAN and NICOBAR islands (very common). DISTRIB.—Java, *Zollinger*, 2nd Journey 808, etc.; Timor Laut, *Forbes* 334; New Guinea and many of the other islands of the Archipelago.

Distinguished in the group by its shortly petiolate leaves and pedunculate lax racemes which are often terminal.

VAR. *Roxburghiana*, Duthie in Fl. Br. Ind. II, 475; leaves almost sessile, cordate and amplexicaul at the base, the apex rounded. *E. decora*, Wall. Cat. 3608.

4. EUGENIA JAMBOS, Linn. Sp. Pl. 47. A shrub or small glabrous tree: young branches more or less four-angled, pale-brown, rather slender. *Leaves* thinly coriaceous, oblong-lanceolate, tapering to each end, the apex acuminate (sometimes almost caudate) the base more abruptly narrowed to the petiole; both surfaces pale-olivaceous when dry; the main-nerves distinct on the lower, 10 to 14 pairs, slightly curved, ascending, interarching in a rather faint nerve '1 in. inside the edge, the secondary nerves rather distinct, one (sometimes two) between each pair of primaries; length 4 to 7 in.; breadth 1 to 1·6 in.; petiole '25 in. *Flowers* 2·5 to 3 in. in diam., in few-flowered terminal racemes shorter than the leaves, the pedicels '3 to '4 in. long. *Calyx-tube* turbinate, '5 in. long, the lobes 4, broad, short, reflexed. *Petals* much larger than the calyx-lobes, obovate-rotund, about '5 in. long; filaments 1·5 to 2 in. long, shorter than the style. *Fruit* ovoid or globular, 1·5 to 2 in. long, dull-yellow tinged with pink, smooth, endocarp fleshy and edible, crowned by the inflexed calyx-lobes. *Seeds* one or two. Roxb. Hort. Beng. 37; Fl. Ind. II, 494; Wall. Cat. 3615; Wight III. II, 14; Duthie in Hook. fil. Fl. Br. Ind. II, 474. Brandis For. Fl. 233; Kurz in Journ. As. Soc. Beng. XLVI. (1877) Pt. 2, 69; For. Fl. Brit. Burm. I, 495. *Jambosa vulgaris*, DC.; Blume Mus. Bot. I, 93; W. & A. Prodr. I, 332; Bot. Mag. 3356; Miq. Fl. Ind. Bat. I, Pt. 1, 425; Wight Ic. 435. *Myrtus Jambos*, Kunth; Korth. in Ned. Kruidk. Arch. I, (1846), 200; Blume Bijdr. 1085.—Rumph. Herb. Amb. I, 123; Rheede Hort. Mal. I, 27, f. 17.

Cultivated in most of the provinces: perhaps wild in Perak; *Scortechini*; *Maingay* 735. Cultivated also in British India.

Readily distinguished in this section by its narrow leaves attenuated to each end and few-flowered terminal racemes.

5. EUGENIA MALACCENSIS, Linn. Sp. Plantar. 470. A glabrous tree, 30 to 40 feet high; young branches almost terete (slightly compressed) with pale bark. *Leaves* coriaceous, with short but distinct petioles, narrowly elliptic-oblong to oblanceolate-oblong, the apex more or less suddenly acute, the base much tapered to the petiole: when dry the upper

surface olivaceous the lower pale-brown: main-nerves 10 to 12 pairs, slightly curved upwards, interarching to form a marginal nerve '1 in. to '15 in. from the edge; length 6 to 11 in.; breadth 1'75 to 3 in.; petiole '3 to '5 in. *Flowers* 1 to 1'5 in. in diameter, in sessile or shortly pedunculate fascicles of three from the branches below the leaves. *Calyx-tube* obconic about '5 in. long, tapering into the quarter inch long ebracteolate pedicel; calyx-lobes 4, broadly rounded, coriaceous, not reflexed. *Petals* orbicular, with a broad claw, the edges thin, about '4 in. in diam. (when dry). *Fruit* about the size of a hen's egg, obovate, turbinate to elliptic-ovoid, smooth and glossy, from pale-rose-coloured to dark-purple, crowned by the inflexed calyx-lobes, edible. *Seed* usually solitary. Duthie in Hook. fl. Fl. Brit. India. II, 471; Roxb. Fl. Ind. II, 483; Wall. Cat. 3611; Wight III. II, 14, t. 98; Kurz in Journ. As. Soc. Beng. XLVI, Pt. 2, 68; For. Fl. Brit. Burm. I, 493. *E. macrophylla*, Lam. Encyc. III. 196. *Jambosa malaccensis*, DC. Prod. III, 286; Korth. in Ned. Kruidk. (1847), 200; Bot. Mag. 4408; W. & A. Prodr. I, 332. *J. purpurascens*, DC. l.c. excl. syn. Roxb. *J. domestica*, Rumph. Herb. Amb. I, 121, t. 37 (not good) and 38, f. i; DC. l.c. 288; Blume Mus. Bot. I, 91; Miq. Fl. Ind. Bat. I, Pt. 1, 411. *Myrtus macrophylla*, Spreng.; Blume Bijdr. 1084. *M. malaccensis*, Spreng.; Blume l.c. 1083. —Burm. Fl. Ind. 114; Rheede Hort. Mal. I, 29, t. 18.

Doubtfully wild in any of the Provinces, but frequently cultivated as it also is in Burma, the Malayan Islands and British India.

The variety with very dark purple ovoid-elliptic fruit was described as a species by Roxburgh and has the following synonymy:—*Eugenia purpurea*, Roxb. Hort. Beng. 37; Fl. Ind. II, 483; Wight III. II, 14; Ic. II, 549. *Jambosa purpurea*, Wall. Cat. 3610. *J. domestica*, var. *purpurea*, Blume Mus. Bot. I, 92; Miq. l.c.—*J. nigra*, Rumph. Amb. 125, t. 38, fig. 1?

6. *EUGENIA PSEUDO-FORMOSA*, King n. sp. A glabrous shrub; young branches slender, sub-terete, compressed near the nodes, pale. *Leaves* sub-coriaceous, elliptic or oblong-elliptic, acuminate, slightly narrowed to the rounded base; upper surface olivaceous-brown when dry, the lower pale yellowish-brown; main-nerves 14 to 20 pairs, curving upwards, interarching '15 to '25 in. from the margin; length 7 to 12 in.; breadth 3 to 5 in.; petiole '1 or '2 in. long, or absent. *Flowers* white tinged with red, sessile in densely crowded fascicles or very condensed cymes at the apices of the branches, '6 in. in diam., the buds globular. *Calyx* '4 in. long; the tube cylindric-campanulate, the mouth with 4 broad blunt lobes becoming hardly triangular. *Petals* orbicular. *Style* 1'5 in. long. *Stamens* and *fruit* unknown.

PERAK: Wray 1809, 3581; King's Collector 3401, 5389, 6254; Scortechini. SINGAPORE: Ridley 9520.

A species resembling *E. formosa* in its shrubby habit and its leaves; the latter are however thinner in texture and they have more numerous nerves. The flowers of this are however sessile fasciculate and much smaller in size. *Wray* 3688 and *Ridley* 9628, which has its clavate flower buds in very short racemes, is probably a form of this species. *E. samarangensis* DC. much resembles this but has its flowers in small racemes or panicles.

7. *EUGENIA PAPILLOSA*, Duthie in Hook. fil. Fl. Br. Ind. II, 495. A tree 40 to 50 feet high: young branches stout about as thick as a goose-quill, terete, brown, those of the inflorescence 4-angled. *Leaves* coriaceous, somewhat amplexicaul, oblong-elliptic sometimes obovate-elliptic or lanceolate, subacute or blunt, narrowed to the cordate auriculate sub-amplexicaul base; upper surface smooth, shining, dark-olivaceous or blackish-brown; under surface reddish-brown; main-nerves 16 to 20 pairs, curving slightly upwards and interarching '1 to '2 in. from the edge, very prominent on the lower surface like the mid-rib, inconspicuous or depressed on the upper; length 8 to 12 in.; breadth 3 to 5 in.; petiole less than '1, very thick. *Panicles* pedunculate, crowded at the apices of the youngest shoots or axillary, shorter than the leaves: the branches mostly short, divaricate, scurfy like the branchlets. *Flowers* (the stamens included) '6 in. long, sessile and collected in globose-clavate bracteate heads of 5 to 8 at the apices of the branchlets; the bracts oblong, blunt, deciduous. *Calyx* '35 in. long, funnel-shaped, narrowed above the middle to a pseudo-stalk: the limb wide and with 4 broadly triangular, unequal, reflexed, blunt lobes. *Petals* orbicular, three times as long as the calyx-lobes, not much shorter than the stamens. *Fruit* unknown. *E. anacardifolia*, King MSS.

MALACCA; *Manigay* (K.D.) 737; *Holmberg* 873. SINGAPORE: *Ridley* 3829. PERAK: *Scortechini*; *King's Collector* 2813, 5869, 8475.

8. *EUGENIA DENSIFLORA*, Duthie in Hook. fil. Fl. Br. Ind. II, 473. Shrubby, occasionally arboreous, glabrous: young branches compressed, pale-brown. *Leaves* coriaceous, narrowly elliptic-oblong, acuminate, the base cuneate, both surfaces glabrous, shining, finely reticulate, the upper olivaceous (when dry) the lower pale-brown; main-nerves 12 to 20 pairs, slender but distinct on both surfaces (when dry), ascending slightly, curved and interarching '3 to '4 in. from the edge, a second series of short arches being interposed between these and the margin; length 5 to 8 in.; breadth 1.75 to 2.5 in.; petiole '35 to '5 in. *Panicles* terminal, many-flowered, compact; the branchlets numerous and few-flowered. *Flower-buds* clavate, about '5 in. long just before expansion. *Flowers* about '75 in. across, white, much tinged with red. *Calyx-tube* funnel-shaped, '3 to '4 in. long, jointed to a stout pedicel shorter than itself; the 4 lobes, '15 in. long, unequal, broad, rounded. *Petals* much larger than the calyx-lobes, sub-orbicular, much shorter than the

stamens. *Fruit* as large as a cherry, rose-coloured, globular, with a tough smooth epicarp, the apex crowned by the large calyx-lobes. *Seed* one, rarely two. *Jambosa densiflora*, DC. Prod. III, 287; Korth. in Ned. Kruidk. Arch. I, 200; Blume Mus. Bot. I, 93; Miq. Fl. Ind. Bat. I, Pt. 1, 416. *Myrtus densiflora*, Blume Bijdr. 1087. *Eugenia corymbosa*, Roxb. Fl. Ind. III, 497; Wight Ic. 627.

MALACCA: *Maingay* (K.D.) 760/1 762/2 (p 758). PERAK: *King's Collector* 738, 4355, 4682, 5721, 5855, 5868, 7065, 8102, 10940; *Scortechini* 149, 743; *Wray* 544. SINGAPORE: *Ridley* 356, 5072. PAHANG: *Ridley* 2646. PENANG: *Curtis* 3431. DISTRIB.—Sumatra, Java.

A very handsome species somewhat resembling *E. Jambos*, L. but distinguished by its dense terminal panicles of flowers which are individually smaller than those of that species, also by its broader leaves, and smaller fruit; allied to *E. pendens*, Duthie and *E. garcinifolia*, King.

9. *EUGENIA PLUMBEA*, King n. sp. A glabrous tree; young branches only as thick as a crow-quill, 4-angled, with dark bark. *Leaves* thinly coriaceous, lanceolate, acuminate, somewhat narrowed at the base; both surfaces of a dull leaden colour when dry, the upper shining, the lower dull; main-nerves 10 to 12 pairs, prominent on the lower, depressed on the upper surface; length 3 to 4 in.; breadth 1 to 1.5 in.; petiole 1 in. *Flowers* about .75 in. in diam., greenish-white, in terminal or axillary shortly pedunculate racemes of about three. *Calyx* .6 in. long, campanulate or widely funnel-shaped, suddenly contracted just above its insertion on the short pedicel; the mouth wide, divided into four broad, rounded segments .15 in. long. *Petals* rotund-reniform, longer than the calyx-teeth, shorter than the stamens. *Fruit* unknown.

PERAK: on Gunong Pateh, elevat. 3400 feet; *Wray* 479.

A species resembling this has been collected in Borneo by Mr. Ridley (Herb. Ridley 9071).

10. *EUGENIA SCORTECHINII*, King n. sp. A glabrous shrub or tree: young branches thicker than a crow-quill, boldly 4-angled, winged below the nodes. *Leaves* scantily pellucid-dotted, sub-coriaceous, ovate-oblong to oblong-lanceolate, acute rarely acuminate, narrowed to the rounded occasionally minutely cordate base; both surfaces brown when dry, the lower paler; main nerves 7 to 10 pairs, prominent on the lower surface, curving upwards, and joining to form a bold nerve .2 in. from the edge, between which and the edge is a second series of minute arches; length 4 to 6 in.; breadth 1.35 to 2.35 in.; petiole .15 in. sometimes absent. *Racemes* terminal and in the upper leaf-axils, corymbose, condensed, very much shorter than the leaves, 3- to 9-flowered. *Flowers* pale-red, with some yellow in the centre, about .65 in. in diam., on very short pedicels. *Calyx* shortly and widely campanulate, .4 in. long,

smooth, the mouth with very broad short unequal lobes, very little contracted at the base. *Petals* red, orbicular, longer than the calyx-lobes, much shorter than the stamens. *Fruit* broadly oblong, the apex truncate and crowned by the thick, deep, cup-shaped calyx, about .5 in. long, the base abruptly contracted into a short pseudo-stalk.

PERAK: *Scortechini* 649; *King's Collector* 4734, 7801, 10076.
MALACCA: *Manigay* (K.D.) 736.

This resembles *E. diospyrifolia*, Wall., but that species has long-stalked flowers, with a narrower calyx-tube, and the nervation of the leaves is different. This also resembles *E. coarctata*, Blume, which however differs in having pale terete young branches and larger leaves, and *E. æmula*, Blume, from which it differs in the number of the nerves of the leaves and in its thicker young branches. From *E. macrocarpa*, Roxb., this differs in its much thinner quadrangular branches and much smaller flowers and fruit.

VAR. *parvifolia*; leaves narrowly oblong-lanceolate, only from 3 to 6 in. long and .8 to 1.25 in. broad.

PERAK: *King's Collector* 3348, 10437.

11. *EUGENIA MOLLIS*, King n. sp. A hairy shrub or small tree: young branches slender, pale-brown, 4-angled like the rachis and branches of the panicle but not winged, covered with short, thick, brown hairs. *Leaves* sub-coriaceous, oblong-lanceolate, the apex finely acuminate, slightly narrowed to the rounded, slightly cordate base; upper surface pale olivaceous-brown, subglabrous; the lower darker and everywhere covered with hairs like those on the young branches and inflorescence; length 8 to 12 in.; breadth 1.75 to 4 in.; petiole .1 to .2 in. *Panicles* terminal, shortly pedunculate, nearly as long as the leaves; the branches spreading and more or less trichotomous at their extremities. *Flowers* numerous but not crowded, about .5 in. across when expanded. *Calyx-tube* .4 in. long, clavate, densely and minutely scurfy-hairy tapering much to the short pedicel; the mouth .3 in. across, divided into 4 subequal rounded lobes about .1 in. long, their edges thin and glabrous. *Petals* orbicular, white, much longer than the calyx-lobes. *Fruit* ovoid-globose, crowned by the cupular calyx, covered with deciduous scurf-like hairs, .6 in. long.

PERAK: *King's Collector* 2686, 2808, 5572, 8387; *Wray* 2372.
DISTRIB.—Sumatra, *Forbes* 1475.

12. *EUGENIA QUADRATA*, King n. sp. A glabrous tree, 20 to 30 feet high: young branches as thick as a goose-quill, acutely 4-angled and narrowly winged, pale-brown. *Leaves* thinly coriaceous, narrowly oblong, much acuminate, slightly narrowed and cordate at the rounded base; upper surface pale olivaceous-brown when dry, the lower darker brown and often not olivaceous; main-nerves 20 to 25 pairs, slender,

distinct, interarching .1 in. from the margin; the reticulations minute; length 8 to 10 in.; breadth 1.75 to 2.75 in.; petiole very short .05 in. long. *Cymes* very short, glomerulate, 3-flowered, pedunculate, solitary and axillary or in groups of 3 or 4 and terminal, about 2 to 3 in. long; their peduncles compressed, 1 to 1.5 in. long. *Flowers* white, about .75 in. in diam.: *calyx-tube* .5 in. long, widely campanulate, suddenly contracted into a long pseudo-stalk, epedicellate; calyx-lobes 4, unequal, broad, rounded, only .1 in. long or less, reflexed. *Petals* orbicular, much larger than the calyx-lobes. *Stamens* slightly exceeding the petals. *Fruit* unknown.

PERAK: *King's Collector* 5547.

In shape and nervation the leaves of this somewhat resemble those of *E. mollis*, King.

13. *EUGENIA SCALARINERVIS*, King n. sp. A glabrous tree, 20 to 30 feet high: young branches nearly as thick as the little finger, slightly compressed, pale. *Leaves* coriaceous, elliptic-ovate, sub-acute, the base rounded and cordate; upper surface brown slightly tinged with olivaceous (when dry), the lower much paler; main-nerves 22 to 30 pairs, very prominent on the lower and depressed on the upper surface, curving very slightly upwards and interarching .15 in. from the margin, the intermediate nerves rather distinct, the reticulations few and large; length 10 to 14 in.; breadth 5 to 7 in.; petiole about .3 in., stout, wrinkled when dry. *Flowers* in much contracted few-flowered terminal racemes, 1.5 in. or more across. *Calyx-tube* magenta-coloured (*vide collector*), smooth, .75 in. long, contracted at the base into a pseudo-stalk .15 in. long and jointed to a pedicel .15 in. long; the mouth wide, divided into 4 broadly-triangular teeth .15 in. long. *Petals* unknown. *Style* about 1 in. long, the stamens shorter. *Fruit* (unripe) globular-ovoid, crowned by the large, wide-tubular, 4-lobed calyx-limb .75 in. long.

PERAK: *King's Collector* 8200; *Ridley* 3095.

The specimens of this very fine species are scanty and imperfect. It is distinguished by the great size of its leaves and by the large number and the prominence of their sub-horizontal nerves.

14. *EUGENIA PERGAMENTACEA*, King n. sp. A tree?; young branches terete, as thick as a quill, pale-brown. *Leaves* chartaceous-coriaceous, narrowly elliptic-oblong, abruptly and shortly acuminate, the base cuneate; upper surface when dry shining and of a dull leaden-colour; the lower brown, both finely and transversely reticulate; main-nerves 28 to 32 pairs, very regular, straight, slightly ascending, interarching .15 in. from the margin, prominent on the lower, depressed on the upper surface; length 12 to 16 in.; breadth 4 to 6 in.; petiole .5

in., laterally compressed. *Panicles* 3 or 4 inches long, solitary in the leaf-axils or in groups of 2 or 3 at the apices of the branches; the branchlets few, short, spreading, bearing 3 or 4 flowers at their apices. *Flowers* .6 in. in diam.; depressed globular in bud. *Calyx-tube* shortly and widely campanulate, suddenly contracted into a pseudo-stalk .1 in. long; the teeth 4, short, unequal, rounded, inflexed. *Petals* 4, orbicular-ovate, pellucid-dotted, not much longer than the stamens, free. *Fruit* globular, smooth, crowned by the short calyx-cup, 1 in. in diam., black when dry. *Syzygium subdecussatum*, Wall. Cat. 5589 in part.

PENANG: Curtis 1440.

Since the time of Wallich who issued it along with his *Syz. subdecussatum* this has been collected by Mr. Curtis only. The elongate leaves of parchment-like texture with many straight very regular nerves and short panicles and globular fruit distinguish it.

15. *EUGENIA DYERIANA*, King n. sp. A tree, 40 to 50 feet high; young branches as thick as a goose-quill; young branches terete below, compressed near the apex, dark-brown. *Leaves* thickly coriaceous, elliptic, (oblong in the variety), slightly narrowed at each end; both surfaces dark-brown when dry and shining; the upper with midrib and main-nerves impressed, the reticulations invisible; the lower of a warmer brown colour, the main-nerves and midrib (but not the reticulations) very bold: main-nerves 13 to 20 pairs, slightly curved, ascending, interarching .1 in. or more from the recurved edge; length 7 to 9 in.; breadth 3.5 to 5 in.; petiole .4 to .6 in.; short. *Panicles* narrow, few-flowered, much shorter than the leaves, terminal or from the upper leaf-axils, usually pedunculate: branches few, short, spreading, much compressed, the flowers crowded at their apices. *Flowers* .4 in. across when expanded, sessile, obovoid in bud. *Calyx* campanulate, .3 in. long, abruptly constricted into a very short pseudo-stalk, the mouth wide and with 4 small rounded lobes. *Petals* 4, free, not calyptrate, orbicular. *Stamens* white, only .25 in. long. *Fruit* (unripe) globular, smooth, crowned by the small, short, circular remains of the calyx, .75 in. in diam.

PERAK: *Scortechini* 2018; *Wray* 2094; *King's Collector* 6196, 6404, 6767.

VAR. *oblonga*; leaves oblong or narrowly oblong-elliptic, 4 to 8 in. long and 1.25 to 2.75 in. broad; panicles nearly as long as the leaves.

PERAK: *King's Collector* 7669.

A species near *E. Clarkeana*, King, but with larger leaves with more nerves, larger flowers but smaller panicles.

16. *EUGENIA HEMSLEYANA*, King n. sp. A tree, 30 or 40 feet high: young branches thinner than a goose-quill, the bark yellowish-grey.

Leaves large, rigidly coriaceous, elliptic or elliptic-oblong, shortly and bluntly acuminate, slightly narrowed at the base; both surfaces, but especially the upper, dark when dry, the upper shining with the nerves impressed, the lower somewhat paler, dull and the nerves prominent; main-nerves 20 to 25 pairs, slightly curved upwards and interarching .1 to .2 in. from the edge: length 6 to 9 in.; breadth 3 to 3.5 in.; petiole .3 to .35 in. stout. *Panicles* mostly on long 4-angled striate peduncles, terminal, shorter than the leaves, crowded in groups of 6 to 8 at the apices of the twigs; branches few, a long one often from the very base, the remaining short (mostly under one inch), all compressed, and each bearing at its apex a dense capitule of sessile flowers .3 or .4 in. across. *Calyx* .15 in. long, campanulate, contracted and ribbed at the base but not forming a pseudo-stalk; the mouth with 4 broad, rounded, concave teeth. *Fruit* (unripe) globular with numerous bold vertical ribs, the apex crowned by the calyx-lobes.

PERAK: Wray 1803; *King's Collector* 6114, 8697.

The species nearest to this is *E. pergamentacea* which however has larger leaves, fewer panicles and considerably larger flowers.

17. *EUGENIA PACHYPHYLLA*, Kurz in Journ. As. Soc. Beng. XLII, Pt. 2, 332. A glabrous tree: the young branches slender, terete, pale-yellow when dry. *Leaves* coriaceous, obovate to obovate-oblong, the apex abruptly and broadly apiculate, the base cuneate; upper surface olivaceous-brown when dry, the lower pale-brown: main-nerves 12 to 15 pairs, slender but distinct on the lower surface, spreading, slightly curved and interarching about .1 in. from the margin, length 3.5 to 5 in.; breadth 2 to 2.25 in.; petiole .2 to .3 in. *Flowers* .3 in. in diam., in pedunculate few-flowered corymbose racemes or panicles axillary or clustered at the apices of the branches, the common peduncles 1 to 1.5 in. long, those of the branchlets (in the panicles) half as long, all 4-angled, the flowers themselves sessile at the apices, the buds globose-clavate. *Calyx* in the expanded flower .4 in. long, widely funnel-shaped, suddenly contracted into a cylindric tube, the 4 lobes of the mouth about .2 in. long, broad, rounded. *Petals* sub-orbicular, larger than the calyx-lobes. *Stamens* .4 in. long. *Fruit* unknown. Kurz For. Fl. Br. Burma I, 490; Duthie in Hook. fil. Fl. Br. Ind. II, 477.

MALACCA: *Griffith* (K.D.) 2371/1: *Maingay* (K.D.) 742. DISTRIB.—Burma, *Brandis* 1337.

A species poorly represented at Kew and Calcutta: recognised by its obovate leaves, pale yellow branches, and few-flowered, pedunculate, corymbose racemes or panicles.

18. *EUGENIA LEPIDOCARPA*, Wall. Cat. 3618. A glabrous tree, 40 to 50 feet high: young branches greyish, terete. *Leaves* coriaceous,
J. II. 12

ovate-oblong to broadly ovate, rarely obovate-oblong, the apex blunt with a short abrupt point, or sub-acute, the base slightly cuneate, both surfaces deep-olivaceous brown the upper somewhat shining, the lower dull: main-nerves 10 to 12 pairs, rather straight, slightly ascending and interarching with an intramarginal nerve close to the edge, not conspicuous on either surface: length 3 to 4·5 in.; breadth 1·75 to 2·75 in.; petiole 3 to 5 in. *Panicles* mostly in clusters at the apices of the branches, pedunculate, or shorter than the leaves; branchlets 4-angled, spreading, few-flowered, the flowers sessile, or nearly so, clustered at the apices, ·25 to ·3 in. in diam. *Calyx* clavate-rotund, about ·2 in. long just before expansion, vertically ribbed, tapering to the base; the lobes 4, unequal, less than ·1 in. long, broad. *Petals* rotund, larger than the calyx-lobes. *Fruit* globular-ovoid crowned by the cupular calyx, vertically ribbed, ·4 in. in diam. (unripe). Duthie in Hook. fil. Fl. Br. Ind. II, 466; Kurz in Journ. As. Soc. Beng. XLVI, Pt. 2, 68. *E. grandis*, Wight var. *lepidocarpa*, For. Fl. Br. Burma I, 490.

SINGAPORE: Ridley 1643, 4633, 4657, 4972, 6307, 6308, 8408; Wallich 3618; Walker; Hullet; King. MALACCA: Griffith 2369, 2376, 2373, 2369, 2416; Maingay 725, 757, 759; Hervey; Derry. PERAK: Wray 415, 3907, 3914, 3908; King's Collector 10042. DISTRIB.—Burma.

A species in many respects resembling *E. grandis*, Wight, but with smaller less shining leaves with fewer nerves and broader in proportion to length: shorter panicles, smaller flowers which moreover are mostly sessile, and smaller, ribbed fruit.

19. *EUGENIA GARCINIFOLIA*, King n. sp. A glabrous tree, 60 to 80 feet high; young branches slender, compressed, 6-ridged, brown. *Leaves* thickly coriaceous, elliptic, or elliptic-oblong, the apex with a short abrupt point, slightly narrowed to the sub-acute or rounded base, the edges recurved when dry: both surfaces (when dry) shining, conspicuously reticulate, pale-olivaceous brown, the upper rather the darker, main-nerves 10 to 12 pairs, rather prominent beneath, interarching irregularly ·2 to ·3 in. from the edge, some of the secondary nerves as prominent as the main ones; the reticulations minute but distinct; length 5 to 10 in.; breadth 2 to 3·5 in.; petiole ·2 to ·3 in. *Panicles* terminal, spreading, 3 or 4 in. across and scarcely as much long. *Flowers* probably on thick striate pedicels ·25 in. long. *Calyx* narrowly campanulate, ·5 in. long, the mouth with 4 unequal, short, rounded teeth. *Petals* orbicular. *Stamens* unknown. *Fruit* (young) globular-ovoid, crowned by the 4 triangular calyx-teeth.

PERAK: King's Collector 4541, 6974. SUMATRA: Scortechini 365.

A species allied to *E. densiflora*, Duthie, but with a less dense inflorescence and larger flower-buds. The leaves of this moreover are larger and thicker, the reticulations more marked and the edges recurved.

20. *EUGENIA CRENULATA*, Duthie in Hook. fil. Fl. Br. Ind. II, 490. A glabrous tree: young branches as thick as a goose-quill, terete, brown. *Leaves* thickly coriaceous, elliptic or elliptic-rotund, the apex rounded but with an abrupt short apiculus, the base cuneate; both surfaces (when dry), shining, the numerous reticulations and nerves distinct, the intramarginal nerve very close to the thickened and slightly crenate edge; under surface rather remotely black-pustulate; length 4 to 5 in.; breadth 2·5 to 4 in.; petiole ·3 to ·6 in. *Panicles* terminal, nearly as long as the leaves when in bud, (sometimes longer), corymbosely trichotomous, many-flowered; the peduncle and branches 4-angled, compressed, the nodes and the insertions of the flowers with minute bracteoles. *Flowers* (including the stamens) ·4 in. long, sessile. *Petals* 4, calyptrate. *Calyx* ·2 in. long, campanulate with a truncate mouth, contracted for half its length into a pseudo-stalk. *Fruit* unknown.

MALACCA: Maingay (K.D.) 739. SINGAPORE: Ridley 6232.

Recognisable at once by its crenate leaves; only twice collected and evidently rare. The Singapore specimen has thinner leaves and more slender longer panicles but, in other respects, it agrees with the Malacca one.

21. *EUGENIA GRANDIS*, Wight Ill. II, 17: Ic. t. 535. A glabrous tree, 30 or 40 feet high: young branches terete, dark-brown. *Leaves* thickly coriaceous, ovate-rotund to ovate-elliptic or elliptic-oblong, the apex rounded with or without an abrupt short blunt point, or subacute or acute, the base always narrowed to the petiole: both surfaces shining; and the upper olivaceous, the lower brown when dry: main-nerves 12 to 14 pairs, curving upwards very slightly and interarching, with an intermarginal nerve ·1 to ·2 in. from the edge: the secondary nerves and lax reticulations slender but distinct like the main ones on both surfaces, length 3·5 to 7 in.; breadth 1·75 to 4 in.; petiole ·4 to ·65 in. *Panicles* mostly clustered at the apices of the branches, more than half as long as the leaves, on peduncles ·6 to 1·25 in. long; the branches spreading, an inch or more long. *Flowers* sessile at the ends of the branches, ·35 to ·45 in. in diam. when expanded; the buds just before expansion clavate-rotund, ·5 in. long. *Calyx* clavate, tapered to the short pedicel, ·35 to ·5 in. long, smooth, the 4 lobes concave, orbicular, about ·2 in. long, two much larger than the others. *Petals* of the same size and shape as the calyx-lobes. *Filaments* ·35 in. long. *Ripe fruit* oblong-ovoid, 1·5 in. long, crowned by the cup-shaped calyx-limb, 1-seeded. Duthie in Hook. fil. Fl. Br. India I, 475; Kurz in Journ. As. Soc. Beng. XLVI, (1877), Pt. 2, 67; For. Fl. Brit. Burm. I, 489. *E. firma*, Wall. Cat. 3603; not of DC. *E. cymosa*, Roxb. Hort. Beng. 37; Fl. Ind. II, 492; not of Lam. *Jambosa grandis*, Blume Mus. Bot. I, 108. *J. firma*, Blume l.c. *J. urceolata*, Korth. in Miq. Fl. Ind. Bat. I,

Pt. 1, 418 in part. *Syzygium grande*, Walp. Repert. II, 180; not of Wall. Cat. 3554. *S. firmum*, Thwaites Enum. 417. *S. montanum*, Thwaites l.c. 116.

MALACCA: Griffith (K.D.) 2368, 2369, 2370, 2371; Maingay 730, 723. SINGAPORE: Ridley 4633; Hullet. LANGKAWI: Curtis. PENANG: Curtis 7515. DISTRIB.—British India in Burma, Chittagong, Sylhet and Assam.

A species easily recognised by its thick glossy reticulate leaves, large (mostly) terminal panicles with large flower-buds and ovoid-cylindric smooth fruit crowned by the cup-shaped calyx-lobes.

Included under this both by Duthie in the Flora of British India and by Trimen in his Flora of Ceylon, is a Ceylon plant (Thwaites C.P. 2694 which he named *S. insigne*). This plant has quite the leaves of *E. grandis*, but the flower buds are much larger and if flowers and fruit were available it would probably turn out to be specifically distinct. *E. grandis*, Wight, is allied closely to *E. lepidocarpa*, Wall.

22. *EUGENIA THUMRA*, Roxb. var. *PENANGIANA*, King. A medium-sized tree; young branches somewhat thinner than a goose-quill; the bark rough, brown. *Leaves* coriaceous, oblong-elliptic or oblong-lanceolate, sub-acute or bluntly and very shortly acuminate, the base cuneate; both surfaces dull; the upper dark leaden-brown, the nerves and midrib impressed; lower surface dark-brown, the nerves and midrib prominent; main-nerves 15 to 20 pairs, curving upwards, interarching .1 in. from the edge; length 4 to 5 in.; breadth 1.8 to 2 in.; petiole .3 to .5 in. *Panicles* nearly as long as the leaves, terminal and axillary, pedunculate, lax; the branches numerous, spreading, 4-angled like the peduncle, the smaller compressed. *Flowers* .35 in. long (including the stamens), sessile, white, crowded, 5 or 10 together at the apices of the ultimate branchlets, clavate in bud. *Calyx* funnel-shaped, narrowed for half its length into a ribbed pseudo-stalk, the mouth with 4 broad, suborbicular lobes. *Fruit* unknown.

PENANG: Curtis 2410.

This differs from the typical *E. Thumra*, Roxb., in having narrower leaves with fewer nerves and rather shorter panicles the branches of which are more acutely 4-angled. Fruit of this is unknown: when found it may yield characters warranting the separation of this as a distinct species.

23. *EUGENIA GRIFFITHII*, Duthie in Hook. fil. Fl. Br. Ind. II, 481. A tree, 50 to 80 feet high; young branches thinner than a goose-quill, their bark brown and rather rough. *Leaves* coriaceous, oblong or narrowly elliptic, narrowed about equally at base and apex, both surfaces dark-brown when dry, shining; main-nerves 15 to 20 pairs, spreading, rather straight, interarching .1 in. from the edge, depressed on the upper and prominent on the lower surface, reticulations small, indistinct; length 4.5 to 6 in.; breadth 2 to 2.5 in.; petiole .2 to .3 in.

Panicles small, racemose, in clusters of 6 to 8 at the apices of the branches, few-flowered, unequal in length but all shorter than the leaves and on more or less long, compressed, dark-coloured peduncles; the branches few, unequal in length but all under an inch, compressed; flowers in threes, sessile at the apices of the branchlets, the buds clavate. *Calyx* campanulate, .25 in. long, constricted for more than half its length into a thick pseudo-stalk: the mouth with 4 broad, rounded lobes. *Petals* 4, orbicular not calyptrate. *Fruit* (unripe) globular-ovoid, slightly corrugated, crowned by the small circular remains of the calyx.

MALACCA: *Griffith* (K.D.) 2375. PERAK: *Wray* 2713; *King's Collector* 6192. SINGAPORE: *Ridley* 4980, 4981, 7951.

24. *EUGENIA CLARKEANA*, King, n. sp. A tree 30 to 50 feet high; young branches as stout as a quill, terete, compressed near the nodes, brown. *Leaves* coriaceous, elliptic-oblong to elliptic, very shortly acuminate, gradually narrowed from about or below the middle to the acute base; upper surface dark-brown, shining, not reticulate, the nerves faintly impressed; lower liver-coloured, rather dull, with numerous small pustules, the 12 to 16 pairs of curved main-nerves slightly prominent, the intramarginal nerves about .1 in. distant from the slightly recurved edge, reticulations invisible; length 4.5 to 8 in.; breadth 1.75 to 3 in.; petiole .3 to .35 in. *Panicles* mostly terminal, shorter than the leaves, pyramidal, with many 4-angled, often compressed branches. *Flowers* sessile, in densely crowded capitules at the apices of the branchlets, about .35 in. across when expanded, white. *Petals* 4 or 5, free, broadly oblong, not calyptrate. *Calyx* widely campanulate, nearly .2 in. long, constricted at the base, rugulose; its mouth with 4 broad, shallow, blunt lobes. *Fruit* globular and 1-seeded or depressed-reniform and 2-seeded, vertically corrugated when young, rugulose when ripe, shining, black, crowned by the small circular remains of the calyx; the globular form .75 in. or more in diam., the reniform form about 1 in. long and 1.35 in. broad; pulp none.

PERAK: *Scortechini* 205; *King's Collector* 3349, 3491, 3573, 6822, 7811.

Allied to *E. Griffithii*, Duthie, but with a single large terminal panicle instead of a number of small ones and with smaller flowers.

25. *EUGENIA CORRUGATA*, King n. sp. A tree, 30 to 60 feet high; young branches terete but compressed at the apices thinner than a goose-quill, brown. *Leaves* as in *E. Clarkeana*, but the main-nerves not depressed on the upper surface. *Panicles* terminal, short and few-branched; the branches terete. *Flowers* not seen. *Fruit* globular, much corrugated and vertically ridged, especially towards the base and

apex, depressed-globose, the rind .25 in. thick, when fully ripe, greenish-yellow, and 2 to 3 in. in diam.

PERAK: *King's Collector* 5298, 6987.

26. *EUGENIA PENDENS*, Duthie in Hook. fl. Fl. Br. Ind. II, 475. A small tree with pendent branches: young branches compressed, slender, brown. *Leaves* thinly coriaceous, pellucidly dotted, narrowly oblong-elliptic or elliptic, occasionally somewhat oblanceolate, the apex shortly and rather abruptly acuminate, the base cuneate; both surfaces olivaceous when dry: main-nerves 10 to 12 pairs, slender, ascending, slightly curved, interarching .2 in. from the margin, secondary nerves and reticulations indistinct; length 5 to 7 in.; breadth 1.4 to 3 in.; petiole .3 to .35 in. *Panicles* terminal, about 2 in. in diam., condensed, the branchlets about 5-flowered. *Flower-buds* globose-clavate, .5 in. long just before expansion. *Flowers* when expanded nearly .5 in. across. *Calyx-tube* narrowly funnel-shaped, jointed to a pedicel shorter than itself: lobes short, rounded, subequal, reflexed. *Petals* orbicular, longer than the calyx-lobes. *Stamens* .75 in. long. *Fruit* depressed-globular, green flushed with red, smooth, crowned by the short reflexed calyx-lobes, 1 in. in diam.

MALACCA: *Griffith* 2349; *Maingay* 747; *Hervey*. JOHORE: *Ridley* 4200. SINGAPORE: *Ridley* 8048, 8447. PERAK: *Scortechini* 1809, 2021; *Wray* 3537. PENANG: *Ridley* 10242. DISTRIB.—Sumatra, *Forbes* 1377.

A species allied to *E. densiflora*, Duthie, but with leaves of thinner texture, with fewer nerves and no dots. The panicles are also much shorter, fewer-flowered, and the flowers are smaller.

27. *EUGENIA BURKILLIANA*, King n. sp. A tree, 40 to 60 feet high: young branches thinner than a goose-quill, brown. *Leaves* coriaceous, oblong-lanceolate, shortly acuminate, the base cuneate; both surfaces (when dry) shining, pale brownish-green, the upper pitted, the lower with black dots, the edges slightly recurved; main-nerves 10 to 14 pairs, ascending and forming wide arches .1 to .15 in. from the edge, between which and the actual edge is a second intramarginal nerve, the secondary nerves and connecting reticulations almost as prominent, all thin and equally visible on both surfaces, all raised: length 2.25 to 3.5 in.; breadth .9 to 1.25 in.; petiole .35 to .5 in. *Panicles* terminal, sessile, many-flowered, broader than long, much branched, their tops broadly pyramidal, usually somewhat shorter than the leaves: branches thick, striate, 4-angled, slightly compressed. *Flowers* .7 in. long including the stamens, reddish before expansion, afterwards white, sessile, in threes at the ends of the branchlets, clavate in bud. *Calyx* .35 to .4 in. long, striate, funnel-shaped, its lower half gradually narrowed into a

pseudo-stalk: the mouth with 4 broad, rounded, shallow lobes. *Petals* orbicular, not calyptrate. *Fruit* unknown.

PERAK: Wray 2785, 3070; *King's Collector* 4719, 6186.

A species near *E. oblongifolia*, Duthie, but differing in its leaves, which are of the same colour on each surface and have more distinct nerves and reticulations equally visible on both surfaces. The mouth of the calyx too is different, being deeply 4-lobed.

28. *EUGENIA HELFERI*, Duthie in Hook fil. Fl. Br. Ind. II, 480. A considerable tree: young branches indistinctly 4-angled, as thick as a crow-quill, with pale-brown deciduous bark. *Leaves* narrowly elliptic, tapered to each end, the apex obtusely and shortly acuminate, the base cuneate; both surfaces finely reticulate, pale olivaceous-green, the upper the darker: main-nerves about 12 pairs, faint, interarching close to the edge: the secondary nerves very faint; length 2·5 to 3·25 in.; breadth 1 to 1·25 in.; petiole ·2 in. *Panicles* terminal, solitary, spreading, about half as long or sometimes quite as long as the leaves, the branchlets spreading, their bark exfoliating. *Flowers* in threes at the ends of the branchlets, about ·5 in. across; buds clavate. *Calyx-tube* funnel-shaped, ·2 in. long, attenuated at the base to a pedicel ·2 in. long, the 4 lobes of the mouth unequal, short, broad, rounded. *Petals* broadly orbicular, much longer than the calyx-lobes and half as long as the stamens, bearing large pellucid glands on the exterior like the calyx-tube. *Fruit* unknown.

PENANG: *Curtis* 212. SINGAPORE: *Lobb*. PERAK: *King's Collector* 4181. *DISTRIB.*—Burma (Tenasserim) *Helper* 2418.

Closely allied to *E. ramosissima*, Wall., but with smaller flowers.

29. *EUGENIA KURZII*, Duthie in Hook. fil. Fl. Br. Ind. II, 478. *VAR. ANDAMANICA*, King. A tree: young branches as thick as a crow-quill, terete, the bark very pale. *Leaves* thickly membranous, oblong-elliptic, the base cuneate, the apex shortly caudate-acuminate; upper surface pale-olivaceous brown when dry, shining, remotely pitted, the main-nerves faint: lower surface paler brown, not olivaceous, the 10 or 12 pairs of main-nerves rather bold, arching upwards and interarching ·15 to ·2 in. from the edge; length 4·5 to 6 in.; breadth 1·85 to 2·25 in.; petioles ·3 to ·4 in. *Panicles* from the axils of the upper leaves, or terminal, shorter than the leaves, often broader than long, spreading, many-flowered; the branches 4-angled, pale. *Flowers* mostly in threes at the ends of the branchlets, ·6 in. long (including the stamens). *Calyx* ·15 in. long; widely campanulate, narrowed into a thick pseudo-stalk as long as itself; the mouth wide, with 4 broad, rounded, reflexed teeth. *Petals* 4, free, sub-orbicular, reflexed. *Stamens* four times as long as the calyx. *Fruit* unknown.

ANDAMAN ISLANDS, at Hobdaypore; *King's Collector*.

This differs from typical *E. Kurzii* in having narrower more acuminate leaves and longer stamens. The young branches moreover have paler bark. Fruit is as yet unknown, but when found it may afford characters to warrant specific rank for this.

30. *EUGENIA ANISOSEPALA*, Duthie in Hook. fil. Fl. Br. Ind. II, 481. A large tree: young branches terete, thinner than a goose-quill, brown, smooth. *Leaves* coriaceous, ovate to ovate-lanceolate, shortly acuminate, the base cuneate; both surfaces (when dry) dark-brown, the upper shining and with the nerves rather faint; the lower paler brown, the 12 to 14 pairs of curved main-nerves rather distinct, interarching 1 in. from the edge, the secondary nerves somewhat distinct; length 2·5 to 3·5 in.; breadth 1 to 1·75 in.; petiole 2 to 2·5 in. *Panicles* terminal, corymbose, usually shorter than the leaves, the branches numerous, spreading, rather crowded, 4-angled, the peduncle compressed. *Flowers* 5 in. long (including the stamens), sessile, clavate in bud, in threes at the apices of the branchlets. *Calyx* 3 in. long, campanulate-infundibuliform, its lower half contracted into a pseudo-stalk; the limb with 4 unequal, broad, rounded lobes (two being larger and sub-petaloid). *Petals* 4; not calyptrate. *Fruit* unknown. *E. anisosepala*, Duthie in Hook. fil. Fl. Br. Ind. II, 481 in part.

MALACCA: *Griffith* (K.D.) 2380, 2381. *Maingay* (K.D.) 754, 753 (in part). MALACCA: *Derry* 289.

Mr. Duthie remarks that the Griffithian specimens above quoted differ somewhat from those of Maingay inasmuch as they have smaller flowers. With these Mr. Derry's single specimen agrees. Maingay's specimens have a much larger more spreading panicle, with smaller flowers. The material is very poor and I think it is likely that, when more is forthcoming, it will be found that two species are mixed under the name *E. anisosepala*, Duthie.

31. *EUGENIA GAGEANA*, King n. sp. A tree, 40 to 50 feet high: young branches thinner than a goose-quill, terete, compressed at the nodes, brown (when dry). *Leaves* thickly coriaceous, oblong-lanceolate, bluntly acuminate, the base cuneate; upper surface dull-brown, the midrib thin and depressed, the main-nerves faint: lower surface paler brown, the midrib thick and the reticulations and secondary nerves numerous and distinct; the main-nerves 12 to 18 pairs, curving upwards and interarching 1 in. from the edge: length 5 or 6 in.; breadth 1·5 to 2·25 in.; petiole 2·5 to 3 in. *Panicles* terminal, about half as long as the leaves, sessile, corymbose, many-flowered, branching from the base; branches stout, spreading, obtusely 4-angled. *Flowers* sessile, in threes at the apices of the branchlets, globose-clavate in bud. *Calyx* narrowly campanulate, rather abruptly narrowed into a pseudo-stalk about 0·5 in. in length. *Fruit* unknown.

PERAK: *King's Collector* 7563.

32. *EUGENIA HULLETIANA*, King n. sp. A tree, 20 to 25 feet high; young branches thicker than a crow-quill, terete, brown. *Leaves* thinly coriaceous, elliptic or elliptic-ovate, with an abrupt, broad, short, apical acumen, the base cuneate, the edge slightly recurved; upper surface somewhat shining, dull-olivaceous; the lower tinged with brown; main-nerves numerous, about .1 in. apart, rather straight, curving upwards at the ends only and there interarching less than .05 in. from the edge, faint on the upper surface and only slightly conspicuous on the lower, the midrib depressed on the upper surface convex on the lower: reticulations almost invisible on the upper, not prominent on the lower surface; length 3.25 to 4.5 in.; breadth 1.5 to 2 in.; petiole .3 to .4 in. *Panicles* axillary and terminal, as long or nearly as long as the leaves, rather lax, pedunculate; the branches few, spreading, 4-angled, compressed. *Flowers* pale-green, (the stamens white), in groups of three, sessile at the ends of the branches, about .5 or .6 in. long (including the stamens), clavate in bud. *Calyx* about .25 in. long, funnel-shaped, the lower two-thirds cylindric and vertically ribbed; the mouth wide, divided into four broad, rounded lobes. *Petals* 4 sub-orbicular, reflexed, free. *Fruit* unknown.

PERAK: *King's Collector* 7470. *DISTRIB.*—Sumatra, *Ridley* 8973.

A species resembling in many respects *E. glauca*, King, but with larger flowers and differently veined leaves.

33. *EUGENIA CHLORANTHA*, Duthie in Hook. fil. Fl. Br. Ind. II, 487. A small glabrous tree: young branches thin, dark-brown, sub-terete. *Leaves* coriaceous, elliptic or ovate-elliptic, the apex shortly and abruptly acuminate, the base cuneate, both surfaces olivaceous-green when dry: main-nerves numerous, interarching less than .1 in. from the edge, thin but distinct, the secondary nerves and reticulations also distinct: length 4.5 to 6 in.; breadth 2 to 3 in.; petiole .3 to .35 in. *Panicles* much shorter than the leaves, axillary and terminal, divaricate, many-flowered, condensed, trichotomous, the branchlets compressed, 4-angled, short. *Flowers* .3 in. in diam. (excluding the stamens), sessile, clavate. *Calyx* .35 in. long, contracted into a thick, ridged pseudo-stalk for more than half its length, the mouth with 4 short thick, broad, rounded, spreading or reflexed lobes. *Petals* orbicular, greenish, not calyptrate. *Fruit* sub-globular, smooth, crowned by the prominent reflexed or spreading calyx-teeth, .3 to .4 in. in diam.

MALACCA: *Griffith* (K.D.) 2385; *Maingay* (K.D.) 733. SINGAPORE: *Ridley* 445, 3910, 5823, 9220. PAHANG: *Ridley* 1096. PENANG: *Curtis* 180, 1448; *Ridley* 7957, 7952, 10190. JOHORE: *Ridley* 9181. PERAK: *King's Collector* 1277, 4082, 4220, 4076, 6765, 5619, 7511, 8535. *DISTRIB.*—Sumatra, *Forbes* 3098.

Although the petals of this are greenish, the stamens are of a brilliant red colour and as these are more permanent than the petals the specific name is somewhat misleading. There are however some specimens in which the petals are distinctly stated by the collector to be red.

In the Herbarium the species is readily recognised by the large persistent spreading calyx-lobes which crown the fruit and by the greenish colour of the leaves.

34. *EUGENIA PENANGIANA*, Duthie in Hook. fil. Fl. Br. Ind. II, 486. A slender glabrous tree, 40 to 80 feet high: young branches sub-terete, ribbed, those of the inflorescence 4-angled, all pale when dry. *Leaves* coriaceous, lanceolate or oblong-lanceolate rarely oblanceolate, obtusely acuminate, the base cuneate; both surfaces yellowish when dry, the lower slightly paler; nerves numerous spreading not prominent on either surface; length 2 to 3 in. rarely 4 in.; breadth .75 to 1.75 in.; petiole .1 to .15 in. *Panicles* mostly terminal, but a few axillary, 1 to 3 in. long, on slender peduncles, the branchlets numerous divaricate, each bearing at its apex 3 to 5 sessile, white, clavate flowers .5 or .6 in. long. *Calyx* about .4 in. long (longer in fruit), funnel-shaped, abruptly tapering to the base, ribbed (when dry), the limb with 4 or 5 short often obscure teeth. *Petals* orbicular, equal in number to the calyx-lobes, free. *Stamens* short. *Fruit* elongate, gradually tapered to the base from the truncate apex, crowned by the cupular, entire calyx-limb, .5 or .6 in. long.

PENANG: *Maingay* (K.D.) 744; *Curtis* 193, 2790, 2972. PERAK: *Scortechini* 132, 184, 1368, 3410, 5651, 6965; *Wray* 3066. MALACCA: *Derry* 1177.

It is possible that two species may be covered by the preceding description as some of the specimens have smaller thinner leaves and flowers with more constricted pseudo-stalks than the type specimen (*Maingay* 744) on which Mr. Duthie founded the species.

35. *EUGENIA RIDLEYI*, King n. sp. A tree; young branches thinner than a goose-quill, terete, the bark brown, rather rough. *Leaves* thinly coriaceous, oblong- or ovate-lanceolate, acute, or acuminate, the base cuneate; both surfaces rather dull when dry, the upper dark olivaceous brown, the nerves impressed; the lower pale warm brown, the midrib and nerves very prominent; main-nerves 7 to 10 pairs, curving upwards and interarching far from the edge, the secondary nerves prominent but the reticulations obscure; length 3.5 to 4.5 in.; breadth 1.25 to 2 in.; petiole .4 to .5 in. *Panicles* axillary and terminal, half as long as the leaves, the terminal sometimes as long, broad, the branches few and spreading horizontally, compressed especially at the nodes. *Flowers* .3 in. long (including the stamens), green, sessile, the buds clavate; *calyx* .2 in. long, campanulate above, abruptly narrowed

for half its length into a minutely granular pseudo-stalk; the mouth with 4 large, rounded lobes. *Petals* not calyptrate, three times as long as the calyx-lobes, ovate-rotund and like the latter reflexed in flower. *Fruit* unknown.

SINGAPORE: (in the " garden jungle"), *Ridley* 3706, 6416, 6419, 5728, 6233. PENANG: *Curtis* 3010.

Notable for its green flowers.

36. *EUGENIA PYRIFOLIA*, Duthie in Hook. fil. Fl. Br. Ind. II, 487. A tree 20 to 40 feet high; young branches thicker than a crow-quill, pale, terete (the very youngest 4-angled), brownish-white. *Leaves* coriaceous, elliptic-oblong or oblong-lanceolate, occasionally obovate-elliptic, shortly and rather bluntly cuspidate, or cordate-acuminate, the base cuneate; upper surface (when dry) dark olivaceous-brown, shining, the main and secondary nerves and also the midrib depressed, the latter prominent, the former faint; lower surface paler and duller than the upper and the nerves and reticulations rather more prominent, the midrib bold and convex, the former faint; lower surface paler and duller than the upper; length 2.5 to 4 in.; breadth 1 to 1.75 in.; petiole .25 to .35 in. *Panicles* axillary and terminal, shorter or longer than the leaves, laxly branched, corymbose or pyramidal, many-flowered, the branches spreading, slender, acutely 4-angled, bracteoles at the bases of the branches and at the bases of the flowers minute, subulate, deciduous. *Flowers* white, .4 in. long (including the calyx), clavate in bud, sessile in groups of two, three or more at the ends of the branchlets; *calyx* slightly over .2 in. in length, funnel-shaped, vertically striate, the mouth with 4 broad, shallow, rounded teeth. *Petals* reniform-orbicular or orbicular, dotted outside, free. *Fruit* depressed-globular, crowned by the narrow tubular remains of the calyx, not pulpy, .75 in. in diam. when ripe. *E. tumida*, Duthie l.c. 487. *Syzygium pyrifolium*, Wall. Cat. 3584; DC. Prodr. III, 261 (Syzyg.); Korth. in Ned. Kruidk. I, 204; Miq. Fl. Ind. Bat. I, Pt. I, 457. *Calyptanthus pyrifolia*, Blume Bijdr. 1090.

In all the provinces except the Andaman and Nicobar Islands: common.

37. *EUGENIA LINEATA*, Duthie in Hook. fil. Fl. Br. Ind. II, 487. A tree 30 to 60 feet high; young branches thicker than a crow-quill, terete, their bark pale-brown. *Leaves* thinly coriaceous, ovate-lanceolate or narrowly elliptic, rather abruptly and shortly acuminate, the base cuneate; upper surface (when dry) olivaceous-brown, shining, sometimes minutely pitted; the nerves numerous, indistinct, the midrib depressed; lower pale-brown, not olivaceous, the main-nerves more distinct than on the upper, close together, the neighbouring ones

connected throughout their whole length by curving loops; length 2·75 to ·4 in.; breadth 1·1 to 1·75 in.; petioles ·25 to ·35 in. *Panicles* terminal and from the upper leaf-axils, shortly pedunculate, lax, longer than the leaves; branches numerous divaricate, 4-angled, the younger also compressed. *Flowers* ·4 or ·5 in. long (including the stamens), sessile in twos or threes at the apices of the branchlets, the buds clavate. *Calyx* narrowly funnel-shaped, gradually tapering to the base, striate; the mouth with 4 rather deep, broad, rounded, concave lobes. *Petals* 4, orbicular, reflexed. *Fruit* ovoid, crowned by the thick, short, wide, 4-toothed calyx, black and shining when ripe, one-seeded, not pulpy, ·3 in. long and ·2 in. in diam. *E. corymbosa*, Wall. Cat. 3566 F. *Jambosa lineata*, DC. Prodr. III, 287; Miq. Fl. Ind. Bat. I, Pt. 1, 428. *Clavimyrthus lineatus*, Blume Mus. Bot. I, 116. *Myrtus lineata*, Blume Bijdr. 1087.

In all the provinces except the Nicobar and Andaman Islands: common. **DISTRIB.**—The Malayan Archipelago.

A widely distributed species and varying as to size of leaf and also of flower-bud. In some specimens some of the nerves are of a dark colour on the lower surface. This is often confused with *E. rubricunlis*, Miq., which is itself a somewhat doubtful species.

38. *EUGENIA CYMOSA*, Lamk. Dict. III, 109 (*not of Roxb.*). A shrub or small tree; young branches as thick as a crow-quill, terete, pale. *Leaves* thinly coriaceous, ovate, ovate-lanceolate, (narrowly oblong-lanceolate in *var. concinna*), caudate-acuminate, the base cuneate; both surfaces when dry brown, the upper tinged with olivaceous, the numerous nerves and reticulations distinct on the lower less so on the upper; length 2 to 3 in.; breadth 1 to 1·5 in.; petiole ·15 to ·3 in. *Panicles* numerous, axillary and terminal, an inch or two in length, the terminal twice as long, lax, the branches few, spreading, slender, compressed, with 3 or 4 flowers at their apices. *Flowers* sessile, white, ·35 in. long (including the stamens). *Calyx* campanulate, abruptly contracted into a pseudo-stalk, the mouth with 4 small triangular lobes. *Petals* 4, orbicular, free. *Fruit* almost globular, the size of a pea, blueish-black, pulpy, 1- or 2-seeded, (if 2-seeded transversely oblong in shape). Wight Ill. II, 17; Ic. t. 555; Kurz in Journ. As. Soc. Beng. XLVI, Pt. 2, 67; For. Fl. I, 486. Duthie in Hook. fil. Fl. Br. Ind. II, 482. *Syz. caudatum*, Wall. Cat. 3591. *S. vimineum*, Wall. Cat. 3533?. *S. concinnum*, Wall. Cat. 3582. *S. nelitricarpum*, T. & B. in Nat. Tidsch. Ned. Ind. XXV. *S. cymosum*, DC. Prodr. III, 259; Korth. in Ned. Kruidk. Arch. I, 202?. *E. nigrescens*, Poir. Suppl. III, 123?. *E. rhodomelea*, Commers. in DC. Prodr. l.c. *Jambosa tenuicuspis*, Miq. Fl. Ind. Bat. I, 431. *Myrtus cymosa*, Spreng.; Blume Bijdr. 1086.

In all the provinces. **DISTRIB.**—Burma, Sylhet and Assam, Java.

VAR. *concinna* (sp. Wall.); leaves narrowly oblong-lanceolate, caudate-acuminate.

PERAK: *King's Collector* 10521. DISTRIB.—Burma, *Wallich* 3582.

39. *EUGENIA CONGLOMERATA*, Duthie in Hook. fil. Fl. Br. Ind. II, 497. A large tree; young branches thinner than a goose-quill, obscurely 4-angled, blackish-brown, smooth: the older terete, grey, striate. *Leaves* coriaceous, oblanceolate, sub-acute or blunt, much tapered to the base: upper surface (when dry) blackish-brown, shining; the lower liver-coloured, somewhat dull, minutely black-dotted; main-nerves 18 to 20 pairs, spreading, curved, faint, more distinct on the upper than on the under surface, the midrib stout on the lower surface, the edges slightly recurved; length 3 to 4·5 in.; breadth ·8 to 1·75 in.; petiole ·2 to ·35 in. *Inflorescences* generally 2 or 3 together from small tubercles on the naked branches below the leaves, consisting usually of few-flowered capitula on short peduncles from ·25 to ·5 in. long, or of solitary flowers from the bases of the peduncles. *Flowers* small, sub-globular or campanulate, only about ·1 or ·15 in. long, sessile. *Calyx* widely campanulate; the limb with 4 rounded lobes. *Petals* 4, free. *Fruit* pisiform, smooth, crowned by the 4 calyx-lobes and also by the stamens, red, smooth.

MALACCA: *Maingay* (K.D.) 745. SINGAPORE: (near the Botanic Garden), *Ridley* 5073.

40. *EUGENIA URCEOLATA*, King. A tree, 30 to 60 feet high: young branches rather thinner than a goose-quill, 4-angled, with pale brownish-yellow, striate bark. *Leaves* coriaceous, elliptic-oblong, elliptic, or obovate-elliptic, shortly and bluntly acuminate, the base cuneate; upper surface (when dry) dark-brown, shining, pellucid-dotted; the lower warm-brown, with black dots: main-nerves 12 to 18 pairs, curving upwards and interarching ·1 in. or more from the edge; length 5 to 7 in.; breadth 2 to 3·25 in.; petioles ·25 in. long. *Flowers* from small axillary tubercles, solitary, fasciculate or in small panicles, (often several from one axil), much shorter than the leaves and with a few (usually about 3) very short, slender, spreading, 4-angled branches powdered with ferrugineous scurf. *Flowers* about ·35 in. across (including the stamens). *Calyx* an open, rotate cup on a short, thin stalk, the margin divided into 4 broad, sub-orbicular, blunt, spreading, concave lobes. *Petals* 4, orbicular, free, spreading. *Fruit* turbinate, about ·5 in. in diam., crowned by the short calyx-limb. *Jambosa urceolata*, Korth. in Ned. Kruidk. Arch. I, (1847), 202; Miq. Fl. Ind. Bat. I, Pt. 1, 418 (excluding all the synonyms).

PERAK: *Wray* 2423, 2609, 2928, 3134, 3248; *King's Collector* 1908, 2317, 713, 3345, 4262, 6665, 6682, 6600, 10677, 10780. SELANGOR:

Ridley 7336. SINGAPORE: Ridley 256, 4975. MALACCA: Ridley. DISTRIB.—Sumatra.

The rotate 4-lobed calyx distinguishes this species.

41. *EUGENIA GLAUCA*, King n. sp. A tree, 40 to 50 feet high; young branches somewhat thicker than a crow-quill, terete; the bark pale-brown and flaky. *Leaves* coriaceous, oblong- or ovate-lanceolate, often obovate-lanceolate, sub-acute or blunt and with a short blunt point; upper surface (when dry) olivaceous-brown and shining, the lower glaucous (not glaucous in VAR.); the numerous nerves and reticulations very distinct on both surfaces, edge slightly recurved, (not recurved in VAR.) the intramarginal nerve very close to it; length 2.25 to 4 in.; breadth 1 to 2 in.; petiole .25 to .3 in. *Flowers* few, sessile, .3 in. long (including the stamens) and as much wide, in racemes or small, few-branched, axillary or terminal panicles 3 or 4 inches long (often several together), with compressed, 4-angled rachises. *Calyx-limb*, a wide shallow cup with 4 broad, shallow, deciduous lobes, afterwards truncate-erose, below narrowed into a thin pseudo-stalk. *Petals* 4, orbicular, clawed, free, reflexed. *Fruit* unknown.

PENANG: Curtis 1152, 2228. PERAK: Ridley 3086. MALACCA: Derry 1184.

Distinguished by its much reticulate leaves glaucous beneath and its few-flowered inflorescence.

VAR. *pseudo-glauca*, King; like the type but with thinner narrower and more acute leaves with no tendency to be obovate, not glaucous beneath and the edges not recurved.

PERAK: Ridley 3108, 8386. The Dindings; Curtis 3440.

42. *EUGENIA SUBRUF*A, King n. sp. A tree, 20 to 30 feet high: young branches half as thick as a goose-quill, terete, grey or pale-brown after the defoliation of the thin, flaky, brown bark. *Leaves* thickly coriaceous, narrowly elliptic or elliptic-ovate, shortly acuminate, the base cuneate; upper surface (when dry) pale olivaceous-brown slightly shining, the midrib, nerves and reticulations depressed; lower reddish, dull, the midrib and nerves prominent: main-nerves about 8 pairs, curving upwards, interarching at less than .1 in. from the edge to form a somewhat faint intramarginal line, the edges recurved; length 3.5 to 5 in.; breadth 1.5 to 2 in.; petiole .3 to .4 in. *Panicles* terminal and axillary, pedunculate, the few branches very short and crowded at the apex of the peduncle; both peduncle and branches 4-angled. *Flowers* .5 in. long (including the stamens), sessile, in threes at the apices of the very short (.1 in. long) branches, clavate-obovoid in bud. *Calyx* campanulate, funnel-shaped, reduced for a third of its length to a

stout, wrinkled pseudo-stalk: the mouth undulate and with 4 broad shallow deciduous teeth. *Fruit* ovoid, smooth, crowned by the wide circular remains of the calyx, .4 in. long (unripe) and .35 in. in diam.

SINGAPORE: *Ridley* 4588. PENANG: *Curtis* 194.

VAR. *robusta*, King; *leaves* larger (3.5 to 5.5 long and 1.5 to 2.2 in. broad) than in the typical form, and young branches thicker. *Panicles* several, terminal, 2 to 2.5 in. long; the branches more numerous than in the type form and not crowded at the apex, the lower as much as .4 in. long.

PENANG: *Curtis* 194, 1448, 3275.

A very rare but distinct species readily recognised by its short panicles, comparatively large flowers, and by the boldness of the midrib and of the few nerves on the under surface of the leaves which when dry are of a conspicuous terra-cotta colour.

43. *EUGENIA DUTHIEANA*, King n. sp. A tree, 40 to 70 feet high; young branches thicker than a crow-quill, the bark brown, rather rough. *Leaves* coriaceous, elliptic, ovate-elliptic or lanceolate-elliptic, shortly acuminate, the base cuneate; both surfaces brown when dry and rather dull, the lower slightly the paler; main-nerves 4 to 8 pairs, curved, ascending, interarching far from the edge (about .15 in.), impressed on the upper, faintly prominent on the lower surface; the secondary nerves almost as prominent as the main ones; the reticulations indistinct on the lower, invisible on the upper surface; length 3 to 5 in.; breadth 1.25 to 2.25 in.; petiole .15 to .2 in. *Racemes* slender, 1 to 2 inches long, slender, solitary, clustered, terminal or axillary, the rachis dark, 4-angled. *Flowers* few, sessile, clavate in bud, sometimes clustered at the apex of the rachis. *Calyx* .2 in. long, funnel-shaped, half of it contracted into a pseudo-stalk, the mouth wide and with 4 broad, rounded teeth. *Petals* reflexed, orbicular, white. *Fruit* clavate when young, becoming almost globular when ripe, rugulose, crowned by the wide circular remains of the calyx, .75 in. long and .65 in. in diam.

PERAK: *King's Collector* 3966, 4218, 6268; *Scortechini*. MALACCA: *Derry* 256. PENANG: *Curtis* 653. SINGAPORE: *Ridley* 3864, 4982, 8400.

A species resembling *E. minutiflora*, Miq., but with larger flowers and more numerous nerved leaves. It is named after Mr. J. F. Duthie, F.L.S., who elaborated the *Myrtaceæ* for Hooker's *Flora of British India*.

44. *EUGENIA POLYANTHA*, Wight Ill. 17; *Icones* 543. A tall, slender tree; young branches rather thicker than a crow-quill, brown. *Leaves* thinly coriaceous, narrowly elliptic or lanceolate, sometimes oblong-ob lanceolate, shortly and bluntly acuminate, the base cuneate: upper surface (when dry) dark-brown, shining, the nerves scarcely visible; lower paler brown, dull, with numerous minute black dots; main-nerves

8 to 10 pairs, spreading, slightly curved upwards at the ends and interarching less than .1 in. from the edge, slightly prominent on the lower surface: length 3 to 4.5 in.; breadth 1 to 1.5 in.; petiole .2 to .3 in. *Panicles* numerous, from the young branches below the leaves, or rarely axillary, 1 to 1.5 in. long; the rachis and short divaricate branches slender, compressed, 4-angled. *Flowers* at the ends of the branchlets, usually in threes, white, sessile. *Petals* 4, orbicular, free. *Calyx* a little more than .1 in. long, campanulate, constricted for one-third of its length into a pseudo-stalk, rugulose, shining: the mouth with 4 deep, rounded lobes. *Fruit* much depressed-globular if one-seeded, broader than long if two-seeded, always much depressed and crowned by the circular remains of the calyx, black, hard, without pulp, .15 in. long and of the same width if globular, and more than twice as broad if 2-seeded. Duthie in Hook. fil. Fl. Br. Ind. II, 496. *E. nitida*, Duthie l.c. *E. lucidula*, Miq. Fl. Ind. Bat. I, Pt. 1, 444. ? *Myrtus cymosa*, Bl. Bijdr. 1086.

In all the provinces, except the Nicobars and Andamans: common. **DISTRIB.**—Malay Archipelago, Burma.

45. *EUGENIA MANIL*, King n. sp. A tree, 20 to 30 feet high: young branches about as thick as a crow-quill, pale-brown, terete. *Leaves* membranous, elliptic to ovate-elliptic, the apex acuminate, the base cuneate; both surfaces brown when dry, the lower much paler than the upper and with numerous small black dots; main-nerves 5 or 6 pairs, curved, ascending, interarching .1 to .15 in. from the edge; reticulations large, indistinct on the lower and invisible on the upper surface; length 3.5 to 4.5 in.; breadth 1.5 to 2 in.; petiole .2 to .4 in. *Panicles* mostly shorter than the leaves, crowded, from the axils of leaves and of fallen leaves, usually shorter than the leaves, the branches few and slender (one often from the very base), compressed. *Flowers* clustered at the apices of the filiform branchlets, often numerous and crowded, sometimes few, whitish-red in colour, globular in bud. *Calyx* .15 in. long, campanulate, abruptly contracted into a short pseudo-stalk; the mouth with 4 deep, ovate-rotund lobes. *Petals* 4, rotund, slightly longer than the calyx-lobes, free, not calyptrate. *Fruit* depressed-globular, minutely rugulose, crowned by the small circular remains of the calyx, 4 in. broad and slightly less from base to apex.

ANDAMAN ISLANDS: *King's Collectors*.

Named in honour of Mr. E. H. Man, C.I.E., Deputy Commissioner of the Andamans, who has for years given most cordial help in the botanical exploration of the Andaman and Nicobar groups. A species related to *E. polyantha*, Wight, but with larger fewer-nerved leaves, and rather longer flowers and fruit. Also near *E. operculata*, Roxb.

46. *EUGENIA CAUDATA*, King. A glabrous bush or small tree; young branches very slender, sub-terete, the bark pale-grey or brown. *Leaves* thinly coriaceous, lanceolate or ovate-lanceolate, caudate-acuminate, the base cuneate; both surfaces pale-brown when dry, the lower palest; nerves numerous, spreading, scarcely visible; length 1·75 to 3 in.; breadth ·75 to 1·1 in.; petiole ·15 to 3 in. *Racemes* on slender peduncles, axillary or terminal, shorter than the leaves, laxly 3- to 5-flowered. *Flowers* 25 in. across, on slender pedicels 1 to 2 in. long, (longer in fruit). *Calyx* 2 in. long, campanulate, contracted at the very base into a very short pseudo-stalk (less than a quarter of its length), the mouth with 4 short, broad, blunt, deciduous teeth. *Petals* orbicular, about twice as long as the short stamens, deciduous. *Fruit* at first ovoid, afterwards nearly globular, 5 in. long, smooth, crowned by the cupular, short, 4-toothed calyx-limb. *Myrtus caudata*, Wall. Cat. 3631.

SINGAPORE: *Wallich*. PENANG: *Curtis* 654. PERAK: *Curtis* 2007; *Scortechini* 392, 444; *King's Collector* 3654, 4241, 6262; *Wray* 472, 1176, 1574, 2824, 3208, 5341.

A species rather easily recognised by its small caudate-acuminate, lanceolate, indistinctly-nerved leaves and few-flowered, lax racemes. *Wallich* also issued under his No. 3591 a plant to which he gave the name *Syzygium caudatum*. It differs much from this and is in fact *Eugenia cymosa*, Lamk.

47. *EUGENIA FILIFORMIS*, Wall. Cat. 3578. A glabrous tree, 30 to 50 feet high, with slender drooping branches: young branches very slender, terete, dark-coloured. *Leaves* coriaceous, small, pellucid-dotted, lanceolate or ovate-lanceolate, shortly caudate-acuminate, the base cuneate: both surfaces greenish-brown when dry: the nerves numerous, a few slightly conspicuous, the others very faint; length 1·75 to 3 in.; breadth ·75 to 1·2 in.; petiole ·15 to 2 in, slender. *Racemes* slender, very lax, few-flowered, axillary and terminal, as long as or longer than the leaves. *Flowers* 75 in. long including the stamens, inserted on the slender rachis by filiform pedicels 75 to 1·25 in. in length. *Calyx* funnel-shaped, attenuated for half its length into a slender pseudo-stalk; the limb with 4 broad, blunt, reflexed lobes nearly 1 in. long. *Petals* orbicular-reniform, reflexed, 25 in. long. *Ripe fruit* elliptic-ovoid to sub-globular, smooth, 75 in. long, crowned by the calyx-lobes. *Duthie* in Hook. fil. Fl. Br. Ind. II. 478. *Syzygium filiforme* and *S. capillare*, Wall. Cat. 3580 and 3578. *Clavimyrthus virens*, Blume Mus. Bot. Lugd. Bat. I, 114.

SINGAPORE: *Wallich*; *Hullett*; *Ridley* 4569. PENANG: *Wallich*; *Curtis* 1090, 1443. MALACCA: *Griffith* (K.D.) 2389; *Maingay* (K.D.) 721; *Derry* 451, 471. PERAK: *King's Collector* 2321, 5601, 5861, 5925, 6708; *Wray* 1192, 3262; *Ridley* 9640.

48. *EUGENIA ANDAMANICA*, King n. sp. A small glabrous tree : young branches slender, with greyish-brown rather rough bark. *Leaves* coriaceous, rotund-ovate to rotund, with a very short abrupt blunt apiculus, obscurely crenate near the apex, abruptly tapered to the base ; nerves numerous invisible on the upper shining surface and faint on the dull lower surface, curving upward, interarching close to the margin ; length 1·5 to 2·5 in. ; breadth 1 to 2 in. ; petiole ·3 or ·4 in. *Panicles* often as long as the leaves, crowded, pedunculate, axillary and terminal, the branchlets usually trichotomous, 4-angled, bearing 3 or 4 sessile flowers at their apices. *Flowers* about ·5 in. long, clavate, the calyx contracted into a pseudo-stalk more than half of its length, the mouth with 4 erect, equal, triangular, acute teeth. *Petals* 4, orbicular, calyptrate. *Fruit* unknown.

ANDAMAN ISLANDS : *King's Collector*.

49. *EUGENIA HOSEANA*, King n. sp. A glabrous tree, 30 to 40 feet high : young branches thinner than a goose-quill, pale greyish-yellow, terete, the very youngest quadrangular. *Leaves* coriaceous, elliptic to elliptic-oblong, abruptly and shortly caudate-acuminate, the base cuneate ; upper surface dark-brown leaden and shining when dry, the lower pale-brown and dull ; main-nerves 15 to 20 pairs ascending very little, almost straight, interarching ·1 in. from the edge ; length 4·5 to 7 in. ; breadth 1·75 to 2·5 in. ; petiole ·15 to ·3 in. *Racemes* axillary and terminal, solitary, not more than 1 in. long, the rachis with 2 deep grooves. *Flowers* white, ·35 in. long, exclusive of the stamens, sessile, enveloped in several sub-ovate leathery bracts as long as themselves. *Calyx-tube* widely campanulate, contracted slightly at the base but not into a pseudo-stalk ; its texture very leathery ; its mouth with 4 blunt, obtuse lobes. *Petals* orbicular. *Fruit* unknown.

PERAK : *Scortechini* 163 ; *Wray* 2952 ; *King's Collector* 3407.

50. *EUGENIA BENJAMINA*, King n. sp. A glabrous shrub or small tree : young branches thin, terete, pale-brown. *Leaves* thinly coriaceous, conspicuously pellucid-dotted on both surfaces, narrowly elliptic, sometimes oblanceolate-elliptic, with an abrupt, narrow, short apiculus half an inch or more in length, the base cuneate : both surfaces pale yellowish-or greenish-brown when dry ; the nerves very numerous, distinct like the reticulations, interarching near the margin ; length 2·5 to 3 in. ; breadth 1 to 1·5 in. ; petiole ·15 in. slender. *Racemes* axillary or terminal, shorter than the leaves, few-flowered. *Flowers* ·5 to ·6 in. long, (including the stamens), sessile on short stout pedicels. *Calyx* clavate, the mouth with 4 broad, blunt lobes. *Petals* orbicular, with thin edges. *Fruit* when young covered with large convex pellucid glands, crowned by the deeply 4-lobed calyx-limb ; when ripe depressed-globular, the calyx-limb reduced to a ring, 1 in. long and 1 to 1·4 in. broad.

PERAK: Wray 2623, 2797, 3204; King's Collector 7306. DISTRIB.—Sumatra, Forbes 2046.

Named from the resemblance of its leaves to those of *Ficus Benjamina*, Linn. The Perak specimens have no ripe fruit on them and the description of it above given is taken from Forbes's Sumatra specimens which agree in leaf absolutely with those collected in Perak.

51. *EUGENIA VARIOLOSA*, King n. sp. A glabrous shrub, 12 to 20 feet high: young branches slender, 4-angled, pale-brown, profusely dotted, like the leaves on both surfaces and the flowers, with large pellucid glands. *Leaves* thinly coriaceous, oblong-lanceolate, rarely elliptic-oblong, caudate-acuminate, the base cuneate; both surfaces when dry pale-brown; main-nerves 12 to 15 pairs slightly prominent on the lower surface (when dry), ascending, rather straight, interarching .1 to .15 in. from the margin, secondary nerves and reticulations indistinct: length 5.5 to 7 in.; breadth 1.35 to 2.5 in.; petiole .2 to .3 in. *Racemes* axillary and terminal, crowded, only about 1 in. long. *Flowers* white, .4 in. across, on stout pedicels less than .1 in. long. *Calyx-tube* narrowly campanulate, .2 in. long, the mouth with two very unequal pairs of rounded teeth. *Petals* orbicular, thick in the centre, much shorter than the stamens. *Style* about .5 in. long. *Fruit* globular: smooth, prominently glandular-dotted, crowned by the short calyx, .8 in. in diam.

PERAK: Scortechini; King's Collector 3415, 3995, 6036, 10437. SINGAPORE: Ridley 8411, 8449. SELANGOR: Ridley 4973.

Distinguished by having prominent pustule-like glands on all its parts.

52. *EUGENIA CLAVIFLORA*, Roxb. Hort. Beng. 37; Fl. Br. Ind. II, 488. A glabrous tree, 25 to 30 feet high: young branches slender, pale-brown, compressed. *Leaves* thinly coriaceous, lanceolate or oblong-lanceolate, shortly acuminate, the base acute; main and secondary nerves very numerous, curving upwards and interarching less than .1 in. from the edge: length 4 to 6 in.; breadth 1.5 to 2 in.; petiole .1 to .15 in. *Flowers* .6 to .8 in. long, in very shortly stalked, condensed, axillary corymbs, sessile; the calyx-tube narrowly cylindric-clavate, contracted at the base into a slender pseudo-stalk; the mouth with 4 or 5 short, broad lobes. *Petals* 4 or 5, free, white, orbicular-ovate, about .25 in. long; filaments about .6 in. long. *Fruit* narrowly oblong-ovoid, about .8 in. long, smooth, pulpy, crowned by the short, incurved calyx-limb, 1-seeded. Duthie in Hook. fil. Fl. Br. Ind. II, 484; Wight III., II, 15; Ic. t. 606; Kurz in Journ. As. Soc. Beng. XLVI, Pt. 2. 65; For. Fl. I, 480. *Syzygium claviflorum*, Wall. Cat. 3575. *S. longiflorum*, Wall. Cat. 3572. *S. excavatum*, Wall. Cat. 3574. Wall. Cat. *Indeterminata* 8085.

NICOBAR and ANDAMAN ISLANDS; common. DISTRIB.—British India in Burma, Chittagong and Assam.

VAR. *leptantha*; flowers and fruit smaller than in the typical form: flowers in short racemes, not in corymbs: fruit 4 in. long. Duthie in Hook. fil. Fl. Br. Ind. II, 484; Benth. Fl. Austral. III, 283 (*Syz.*); Kurz in Journ. As. Soc. Beng. XLVI, Pt. 2, 65; For. Fl. I, 480. *S. suavissimum*, Wall. Cat. 3573. *Syzyg.* Griff. Notul. 654.

MALACCA: *Griffith* (K.D.) 2366/1, 2367. PENANG: *Ridley* 1021, 1109.

VAR. *excavata*; leaves more coriaceous than in the typical form and somewhat larger, young branches with rather rough bark. *Syzygium excavatum*, Wall. Cat. 3574.

PENANG: *Curtis* 697, 749, 8384, 8393. PROV. WELLESLEY: *Ridley* 6970. PERAK: *King's Collector* 7440. JOHORE: *Ridley* 4076.

VAR. *Maingayi*; young branches rather stout, the very youngest smooth, the older with deeply striate bark. Leaves thickly coriaceous, oblong-lanceolate, shortly acuminate, main-nerves not prominent, the midrib very prominent on the lower surface: length 4.5 to 7.5 in. Flowers about .5 in. long: fruit unknown. *E. Maingayi*, Duthie in Hook. fil. Fl. Br. Ind. II, 484.

MALACCA: *Maingayi* (K.D.) 750.

This is known only from Maingay's imperfect specimens. It does not appear to me to be separable specifically from *E. claviflora*, Roxb.

VAR. *glandulosa*; young branches acutely 4-angled: leaves as in VAR. *Maingayi*: calyx-tube with large pellucid glands.

MALACCA: Mount Ophir; only once collected.

53. *EUGENIA ZEYLANICA*, Wight Ill. II, 15: Ic. I, 73. A glabrous tree, 30 to 60 feet high: young branches slender, obsoletely 4-angled or terete, pale-brown. Leaves coriaceous, lanceolate, sometimes ovate-lanceolate, obtusely acuminate, the base acute: both surfaces shining, brown when dry, the lower minutely glandular and paler: nerves 10 or 12 pairs, indistinct, interarching near the edge, the reticulations obsolete; length 1.5 to 3.5 in.; breadth .35 to 1.5 in.; petiole .05 to .15 in. Panicles axillary and terminal, crowded, the axillary shorter than the leaves, the terminal longer; branchlets short, 4-angled like the main-rachis. Flowers numerous, in twos or threes at the apices of the ultimate branchlets, their length (including the stamens) .35 to .4 in. Calyx funnel-shaped, .2 in. long, sessile or on a short pedicel; the tube ribbed, granular-tubercled; the limb with 4 or 5 ovate-rotund, concave, erect, deciduous lobes. Petals orbicular, 4 or 5, deciduous as a calyptra. Fruit pisiform, smooth, white. Duthie in Hook. fil. Fl. Br. Ind. II, 485. Kurz in Journ. As. Soc. Beng. XLVI, Pt. 2, 65; For. Fl. I, 481. *E. spicata*, Lam. Dict. III, 201; DC. l.c. (*Syz.*). Trimen Fl. Ceylon I, 171.

Bedd. Fl. Sylv. I, t. 202. *E. glandulifera*, Roxb. Hort. Beng. 37; Fl. Ind. II, 496. *S. zeylanicum*, DC. Prodr. III, 260; Wall. Cat. 3564, in part; *Z. corticata*, Wall. Cat. 3565; Dalz. and Gibs. Bomb. Fl. 94. *Acmena zeylanica*, Thwaites Enum. 118. *A. parviflora*, DC. l.c. 262. *Jambosa bracteata*, Miq. Fl. Ind. Bat. I, Pt. 1, 437. *S. corticatum*, Wall. Cat. 3565. *Myrtus zeylanica*, Linn. Sp. Pl. 675.—Rheede Hort. Mal. v. t. 20.

In all the provinces; common. **DISTRIB.**—British India, Ceylon.

54. *EUGENIA GRATA*, Wight Ill. II, 15. A small glabrous tree: young branches sub-terete, the bark pale-brown, loose. *Leaves* coriaceous, ovate-lanceolate to lanceolate, acuminate, the base acute; upper surface brown when dry, the lower pale, main-nerves numerous, curving, ascending, interarching about .1 in. from the edge, distinct as is the midrib on the lower surface in the young leaves, indistinct on the upper: length 2 to 3.5 in.; breadth .85 to 1.5 in.; petiole .15 to .25 in. *Inflorescence* and *flowers* as in *E. zeylanica* but the calyx-tube not granular. *Fruit* ovoid, pellucid-dotted, crowned by the small calyx-lobes, .2 in. long, black when ripe. Kurz in Journ. As. Soc. Beng. XLVI, Pt. 2, p. 65; For. Flora Burma I, 480; Duthie in Hook. fil. Fl. Br. Ind. 486. *Syzyg. gratum*, Wall. Cat. 3586. *S. scabridum*, Wall. Cat. 3564 D. *Myrtus quadrangularis*, Ham.

MALACCA: Griffith (K.D.) 2364. **PENANG:** Curtis 317, 756, 2245; Wallich. **PERAK:** Ridley 7955, 9456; King's Collector 5414, 5433, 6267. **ANDAMAN ISLANDS:** King's Collector. **DISTRIB.**—Sumatra.

A species very close to *E. zeylanica* but with somewhat larger leaves, glaucous or sub-glaucous beneath. The best distinguishing marks lie however in the calyx-tube which in this is smooth, and in the fruit which in this is ovoid and black.

55. *EUGENIA TECTA*, King n. sp. A glabrous tree, 20 to 25 feet high: young branches slender, 4-angled; the bark dark-brown, flakey. *Leaves* thinly coriaceous, almost sessile, ovate-lanceolate, shortly and obtusely acuminate, the base rounded and minutely cordate; both surfaces pale-brown when dry; nerves numerous but scarcely visible, the midrib prominent on the lower surface and bearing small scattered tubercles; length 2.5 to 3.25 in.; breadth 1.1 to 1.6 in.; petiole .05 to .1 in., densely covered with black tubercles. *Flowers* .5 or .6 in. long (including the stamens), crowded in axillary or terminal fascicles, sessile. *Calyx* widely funnel-shaped, tapered to the bracteolate base, minutely dotted; the limb wide, with 5 broad lobes. *Petals* orbicular, yellowish, deciduous. *Fruit* unknown.

PERAK: King's Collector 1863.

56. *EUGENIA PSEUDO-TETRAPTERA*, King n. sp. A tree? Young branches of the thickness of a crow-quill, compressed at the nodes,

4-angled and 4-winged, the bark dark-brown and flakey, deciduous. *Leaves* thinly coriaceous, almost sessile, broadly lanceolate or ovate-lanceolate, the base broad and minutely cordate, the apex shortly and bluntly acuminate; upper surface dull olivaceous-brown with remote black pits, the nerves slightly and the midrib greatly depressed; lower surface pale-brown, with many small black marks especially on the bold thick midrib; main-nerves 14 to 18 pairs, prominent, slightly curved, subascending and interarching at about .1 in. from the edge; length 2 to 2.25 in.; breadth 1 to 1.5 in.; petiole .05 in. wrinkled. *Flowers* in terminal, sessile, multi-bracteate glomeruli about .4 in. long; the bracts about as long as the flowers, large, broadly oblong, blunt, their posterior surfaces bearing many black dots. *Flowers* about .25 in. long, their pedicels less than .1 in. *Calyx* cylindric, slightly contracted at the base; the mouth with 5 erect, ovate, blunt, sub-distant teeth, about .05 in. long. *Petals* sub-orbicular, calyptrate. *Fruit* sub-globular, .25 in. in diam., crowned by the calyx-teeth.

JOHORE: on Gunung Panti, Ridley 4197.

This species comes very near *E. tetraptera*, Miq., but that species has narrower, less conspicuously bracteate flowers and its young branches are covered with glandular hairs. This is also allied to *E. tecta*, King, which has, however, larger flowers in pedunculate bracteate heads. The leaves of the two are almost exactly alike in texture and form, but the dots and pits in those of *E. tecta* are less conspicuous than in these of this plant. This is also closely allied to *E. polita*.

57. *EUGENIA POLITA*, King. A glabrous tree, 30 to 60 feet high; young branches slender, compressed and acutely 4-angled or winged, their bark pale-brown and deciduous. *Leaves* coriaceous, lanceolate or ovate-lanceolate, bluntly and shortly acuminate, the base abruptly cuneate, both surfaces shining and of a liver-brown colour; main-nerves 10 to 12 pairs, often forked, interarching less than .04 in. from the edge, hardly visible on the upper surface, length 1.5 to 2.25 in.; breadth .75 to 1 in.; petiole under .1 in. *Panicles* shorter than the leaves, axillary and terminal, very condensed, many-flowered, bearing coriaceous bracts of two sorts, those at the base of the panicle with long, subulate points, those at the base of its branches and of the flowers oblong with broad truncate apices, the rachis and branches 4-winged. *Flowers* (including the stamens) .35 in. long, sessile. *Calyx* funnel-shaped, ribbed, very coriaceous; the limb much prolonged beyond the ovary, but only slightly expanded, with 5 ovate-rotund, concave, erect lobes. *Petals* orbicular, deciduous. *Stamens* not very numerous nor long. *Fruit* globular, crowned by the 5 calyx-lobes, when young minutely pellucid-glandular. *E. zeylanica*, Duthie (not of Wight) in Hook. fil. Fl. Br. Ind. II, 485, in part. *Syzyg. politum*, Wall. Cat. 3626.

PENANG: Porter; Curtis 511. JOHORE: Ridley 4078. PERAK: *Scortechini* 585; Wray 2822; King's Collector 6930, 8679. MALACCA: Ridley 859.

A species superficially resembling *E. zeylanica*, Wight, but really differing greatly from that and every other species within our region by its prominently bracteate and very condensed inflorescence which has winged branchlets. The fruit has been only twice collected.

58. *EUGENIA VALDEVENOSA*, Duthie in Hook. fil. Fl. Br. Ind. II, 489. A glabrous tree, 20 to 50 feet high: young branches rather thinner than a goose-quill when dry, acutely 4-angled but not winged, the bark brown. *Leaves* coriaceous, elliptic, shortly and abruptly acuminate, the base cuneate or rounded; upper surface olivaceous-brown, reticulate, the nerves faint; lower warm-brown, the main-nerves 14 to 24 pairs, very prominent, curving upwards and interarching in a wavy line .15 to .25 in. from the edge; length 5.5 to 8 in.; breadth 2.35 to 3.5 in.; petiole .2 to .25 in. *Panicles* terminal or from the upper leaf-axils, pedunculate, rather shorter than the leaves, with many spreading, lax branches, the branchlets compressed. *Flowers* white, sessile, in heads on the ends of the branchlets, .4 in. long (including the stamens), the buds narrowly clavate. *Calyx* narrowly infundibuliform, tapering equally from base to apex, the mouth truncate, entire. *Petals* calyptrate. *Fruit* depressed-globular, crowned by the short remains of the calyx-tube, smooth, .75 in. in diam. *L. ellipticum*, Wall. Cat. 3587 in part, (not of other authors).

PENANG: Wallich; Curtis 55; King's Collector 1579; Maingay 723, 762. PERAK: *Scortechini* 1662; Wray 2209, 2842; King's Collector 737, 2737, 4947, 5122, 5322, 7003, 10246, 10873.

Under the pre-occupied name *L. ellipticum*, Wallich issued this species as No. 3587 of his Catalogue. Mixed with it, however, he issued some leaves of a distinct species from Penang. Good specimens, with leaves exactly agreeing with these, have since been found and that plant has been named *E. pergamacea*, King.

59. *EUGENIA OBLONGIFOLIA*, Duthie in Hook. fil. Fl. Br. Ind. II, 491. A tree; young branches somewhat thicker than a crow-quill, very pale, 4-angled (sometimes obscurely so). *Leaves* thinly coriaceous, elliptic or oblong-elliptic, shortly acuminate, the base cuneate; both surfaces shining, the nerves and reticulations distinct; upper surface pale-olivaceous, the lower pale-brown; main-nerves 10 to 16, slender, whitish, not much more prominent than the secondary, interarching less than .1 in. from the edge; length 3 to 4.5 in.; breadth 1.25 to 2 in.; petiole .3 in. long. *Panicles* terminal, corymbose, spreading, many-flowered, 3 or 4 inches in length and as many in breadth; the short peduncle and numerous branches stout, 4-angled, the branchlets

compressed, all very pale. *Flowers* .3 or .4 in. across. *Petals* 4, calyptrate, green. *Calyx* .2 in. long, campanulate, contracted for half its length into a thin pseudo-stalk, smooth; the mouth truncate or very slightly toothed. *Fruit* (unripe) globular, smooth, crowned by the short, wide remains of the calyx, .35 in. in diam.

MALACCA: *Maingay* (K.D.) 746. SINGAPORE: *Ridley* 360, 4993, 10131. PERAK: *King's Collector* 6012, 8848, 10883.

VAR. *parviflora*; flowers smaller than in the typical form: leaves oblong-lanceolate, tapering to each end, 3.5 to 5.5 in. long and 1 to 1.5 in. broad.

PERAK: *Scortechini* 618.

VAR. *robusta*, King; *calyx* .35 in. long; panicles, branches of panicle and young twigs thicker than in the typical form.

PERAK: *Scortechini* 216.

60. *EUGENIA SUBHORIZONTALIS*, King n. sp. A small tree; young branches thinner than a goose-quill, terete, blackish-brown when dry. *Leaves* thinly coriaceous, oblong or elliptic-oblong, tapering to each end, shortly and sharply acuminate, the base cuneate, the edges somewhat recurved (when dry), the upper surface dark olivaceous-brown and shining, the midrib depressed, all the nerves faint, lower surface dark brown, not olivaceous, duller than the upper, the midrib very bold and convex, the main-nerves 15 to 20 pairs, sub-horizontal, thin, but rather prominent and shining, interarching to form a bold intramarginal line .1 in. from the edge, the secondary nerves and reticulations rather distinct; length 4.5 to 7 in.; breadth 1.5 to 2.3 in.; petiole .5 to .6 in. *Panicles* axillary and terminal, the former shorter than the leaves, the latter often longer, lax: the branches rather sparse, spreading, compressed, obscurely 4-angled. *Flowers* white, sessile, in clusters of 3 to 6 at the ends of the branchlets, globose-clavate in bud. *Calyx* .25 in. long, funnel-shaped, contracted to a pseudo-stalk for half its length: the limb with 4 shallow, broad, rounded (sometimes acute) lobes. *Fruit* unknown.

PERAK: *Wray* 2118, 2097. *DISTRIB.*—Sumatra, Hort. Bogor. 3350 under the name of *E. punctulata*, Miq., which it is not.

61. *EUGENIA VALETONIANA*, n. sp. King. A tree, 60 to 80 feet high; young branches thicker than a crow-quill, terete, the bark pale-brown, flakey. *Leaves* as in *E. Griffithii* but somewhat narrower and with rather more numerous main-nerves. *Flowers* sessile in small terminal or axillary panicles shorter than the leaves, with very few short, terete, few-flowered cymose branches, or in small pedunculate cymes. *Calyx* .3 in. long, clavate-campanulate, constricted into a short pseudo-stalk; the wide mouth truncate or with 4 deciduous, short, rounded lobes.

Petals small, orbicular, deciduous. *Fruit* when unripe pyriform, when ripe globular, crowned by the wide calyx-limb, .5 in. long.

PERAK: *King's Collector* 5982, 6090.

A species near *E. Griffithii*, and also near *E. Clarkeana* and *E. Koordersiana*, but with much smaller panicles and fruit at first pyriform.

62. *EUGENIA EXPANSA*, Duthie in Hook. fil. Fl. Br. Ind. II, 491. A tree, 20 to 50 feet high; young branches thinner than a goose-quill, terete, pale-brown. *Leaves* coriaceous, oblong-lanceolate or oblong-elliptic, acuminate, the base cuneate, both surfaces brown (when dry) and shining, the lower paler; main-nerves 20 to 24 pairs, faint, spreading, connected by numerous loops, not very prominent in either surface but distinctest on the lower, intramarginal line less than .1 in. from the edges: length 4 to 6.6 in.; breadth 1 to 2.25 in.; petiole .15 to .2 in. *Panicles* numerous, terminal and axillary, usually 2 or 3 together, varying in length from less than one inch to several inches, the longer ones bearing a few slightly compressed branches with 5 to 8 sessile flowers crowded at their apices. *Flowers* (including the stamens) .3 in. long (sometimes longer), clavate in bud. *Calyx* .15 in. long, infundibuliform, minutely rugulose; the mouth truncate, undulate, slightly reflexed. *Petals* orbicular, calyptrate. *Fruit* unknown. *Syzygium expansum*, Wall. Cat. 3567. *S. euneuron*, Miq. Fl. Ind. Bat. Suppl. 314.

PENANG: *Wallich* 3567; *Curtis* 247. PERAK: *Wray*, *Scortechini*, *King's Collector*; very common.

63. *EUGENIA CHLOROLEUCA*, King. A small tree or shrub; young branches almost as thin as a crow-quill, terete below but 4-angled near the apex, yellowish. *Leaves* coriaceous, oblanceolate, shortly and bluntly acuminate, much narrowed at the base; both surfaces pale-olivaceous; the upper tinged with brown, shining, the main-nerves indistinct or invisible; the lower very pale, dull, the 12 to 16 main-nerves spreading, very faint, the edge thickened and slightly recurved; length 3 to 5.5 in.; breadth 1 to 2.25 in.; petiole .3 to .35 in. *Panicles* much shorter than the leaves, mostly terminal, rarely axillary, trichotomous, the branchlets also trichotomous, all acutely 4-angled and striate, the bracteoles at the nodes and at the bases of the flowers short, concave, ovate. *Flowers* bibracteolate at the base, in threes, .4 in. long (including the stamens) on 4-angled pedicels .1 in. long. *Calyx* .15 in. long, minutely rugulose; the mouth with 4 broad, shallow teeth. *Fruit* ellipsoid, rugulose, crowned by the 4 persistent calyx-teeth, length (unripe) .3 in.

PERAK: *King's Collector* 1901, 4951, 7307; *Scortechini* 45; *Wray* 2917.

This closely resembles *Eugenia fastigiata* (*Calyptanthus fastigiata*, Blume), but the leaves have shorter petioles and fewer nerves and the fruit of this is corrugated

rugulose and not glandular. This also resembles *Eugenia sylvestris* (*Caryophyllus sylvestris*, Blume) almost exactly in leaves: but the fruit of the latter is very different.

64. *EUGENIA NIGRICANS*, King n. sp. A large tree; young branches rather thicker than a crow-quill, sub-terete, dark-brown when dry. *Leaves* oblong to oblong-elliptic, shortly and abruptly acuminate, the base more or less cuneate; both surfaces very dark-olivaceous and dull (when dry), the lower with a reddish tinge: nerves very numerous and close together, straight and sub-horizontal, all faint below and distinct above, the reticulations few and faint on both surfaces, the edge recurved, and the intramarginal line very near it; length 2·5 to 4 in.; breadth 1·4 to 2 in.; petiole ·3 to ·4 in. *Panicles* axillary and terminal, not more than half as long as the leaves with few lax trichotomous spreading branchlets, all 4-angled. *Flowers* white, ·3 in. long (including the stamens), in threes, sessile, clavate in bud. *Calyx* ·15 in. long, wrinkled, funnel-shaped, narrowed for half its length into a pseudo-stalk, the mouth wide and truncate. *Petals* deciduous. *Fruit* unknown.

PERAK: *Wray* 2221.

65. *EUGENIA INOPHYLLA*, Roxb. Hort. Beng. 37: Fl. Ind. II, 496. A glabrous tree, 40 to 60 feet high; young branches rather thinner than a goose-quill, terete, dark-brown. *Leaves* coriaceous, narrowly elliptic or elliptic-lanceolate, rather abruptly acuminate, the base cuneate; both surfaces when dry smooth, shining, the numerous thin, curved, ascending main-nerves indistinct; the upper surface almost black, the lower deep-brown; length 3 to 5 in.; breadth 1·25 to 2·25 in.; petiole ·2 to ·4 in. *Panicles* corymbose, in the upper leaf-axils and terminal, nearly as long as or longer than the leaves, on rather long peduncles, many-flowered, each from 2·5 to 3 in. across, the branches and branchlets numerous, 4-angled. *Flowers* 2 or 3 together, sessile at the apices of the branches, ·4 in. long (including the coloured stamens) white, clavate in bud. *Calyx* funnel-shaped, rather abruptly tapered to the base, ·2 in. long, smooth; the mouth truncate, with 5 very obscure, short, broad teeth. *Petals* calyptrate. *Fruit* (according to Roxburgh) pear-shaped, large. Duthie in Hook. fil. Fl. Br. Ind. II, 481 *in part*. Wight Ic. 623 (*bad*). *Jambosa inophylla*, Miq. Fl. Ind. Bat. I, Pt. 1, 433. *Syzygium inophyllum*, Wall. Cat. 3600 *in part*; DC. Prodr. III, 260.

PERAK: *Wray* 1377, 2554, 2655, 2734; *King's Collector* 4741, 6079, 655, 8481. PENANG: *Curtis* 973, 974, 2621.

Two specimens of this are included in the Linnaean Society's set of the Wallichian plants under 3600. The other two sheets belong to two different species.

66. *EUGENIA OBLATA*, Roxb. Hort. Beng. 37; Fl. Ind. II, 493.

A tree, 40 to 50 feet high; young branches terete (when dry), reddish-brown. *Leaves* thinly coriaceous, oblong to elliptic-oblong, or broadly lanceolate, acuminate, the base cuneate; both surfaces brown (when dry), shining, the upper often tinged with olivaceous and the lower with red, main-nerves 20 to 24 pairs, close, connected by numerous secondary nerves and reticulations, indistinct on the upper but distinct on the lower surface, intramarginal nerve very close to the slightly recurved margin; length 3·5 to 5 in.; breadth 1 to 2·5 in.; petiole ·2 to ·25 in. *Panicles* axillary and terminal, shorter than the leaves, often pedunculate, corymbose, the branches and branchlets few, crowded, obtusely 4-angled. *Flowers* 5 in. long, including the stamens, white, sessile, shortly clavate in bud. *Calyx* ·25 in. long, funnel-shaped, the mouth with 4 deciduous, short, blunt lobes, narrowed to a pseudo-stalk. *Petals* orbicular, calyptrate. *Fruit* as large as a cherry when ripe, smooth, pulpy, the pericarp rather thick; seed solitary. Wight Ill. II, 15; Ic. t. 622; Kurz in Journ. As. Soc. Beng. XLVI, Pt. 2, 67; For. Fl. I, 488; Duthie in Hook. fl. Fl. Br. Ind. II, 492. *S. oblatum*, Wall. Cat. 3569. *S. pulchellum*, Wall. Cat. 3566 in part. *Syzg. truncatum*, Miq. Fl. Ind. Bat. I, Pt. 1, 455. *Jambosa pulchella*, Miq. Fl. Ind. Bat. I, Pt. 1, 422. *E. comosa*, Wall. Cat. 3566 D; l.c. 3600 C (under *E. inophylla*).

MALACCA: Derry 1178. PERAK: *Scortechini*. PROVINCE WELLESLEY: Curtis 9378a. PENANG: Ridley 9378.

67. *EUGENIA BERNARDI*, King n. sp. A medium-sized tree; young branches thicker than a crow-quill, slightly compressed, dark-brown, the older terete and grey. *Leaves* thinly coriaceous, broadly elliptic, abruptly and shortly acuminate, the base slightly cuneate; both surfaces brown (when dry) and shining, the lower slightly paler; the numerous close nerves and their connecting reticulations distinct on both; the intramarginal line less than ·1 in. from the edge, the midrib depressed on the upper, prominent on the lower surface; length 3·5 to 4·5 in.; breadth 1·75 to 2·25 in.; petiole ·25 to ·4 in. *Panicles* terminal, occasionally from the branches below the leaves, shorter than the leaves when in flower but longer in fruit, densely corymbose, trichotomously branched, many-flowered, the peduncle and lower branches terete, the branchlets 4-angled. *Flowers* partly sessile and partly on very short thick pedicels, the buds obovoid, obtuse. *Calyx* ·15 in. long, campanulate-cylindric, tapering slightly to the base but not forming a pseudo-stalk, smooth, the limb truncate. *Petals* falling off in a depressed calyptra. *Stamens* ·25 in. long. *Fruit* turbinate, black when ripe, without pulp, crowned by the minute remains of the calyx, ·2 in. in diam.

PERAK: *Scortechini* 326. SELANGOR: Ridley 8617. PENANG: Curtis 975, 2845.

Remarkable for its short, obovoid flower-buds; closely related to *E. simulans* which has, however longer clavate buds.

68. *EUGENIA PRAINIANA*, King n. sp. A tree 60 to 80 feet high; young branches as thick as a goose-quill, terete, brown. *Leaves* thickly coriaceous, elliptic-oblong, the apex shortly acuminate, the base cuneate; upper surface dark-brown, shining, the midrib pale and depressed, the nerves slightly raised, faint; lower surface yellowish-brown, dull, the 20 to 30 pairs of main nerves and the intramarginal one slightly raised but indistinct, edges slightly recurved; length 3·5 to 5 in.; breadth 1·5 to 1·75 in.; petiole about ·5 in. *Panicles* mostly terminal, but a few of smaller size from the upper leaf-axils, about half as long as the leaves while in flower, many-flowered, much condensed, corymbose, broader than long; the peduncles short, stout, somewhat 4-angled like the stout, short branches. *Flowers* in threes at the ends of the branchlets, sessile, white, clavate in bud. *Calyx* ·35 in. long, funnel-shaped, tapering gradually to the base: the mouth 5-lobed, the lobes broad, rounded, and with pale, cartilaginous tips. *Petals* 5 orbicular, glandular-dotted, much longer than the calyx-lobes, apparently calyptrate. *Fruit* (unripe and excluding the long calyx-tube) globular-ovoid, ·75 to 1 in. in length, and ·75 in. in diam., crowned by the large, stout, withered, 5-toothed calyx-limb ·25 in. long.

PERAK: *Wray* 3990; *King's Collector* 5309, 6584.

69. *EUGENIA PEARSONIANA*, King n. sp. A tree 80 to 100 feet high; young branches thicker than a crow-quill, pale brown or whitish, terete. *Leaves* coriaceous, ovate, the base rounded, the apex caudate-acuminate, the edges somewhat recurved; upper surface olivaceous-brown, shining, the numerous nerves faint, the midrib depressed; lower surface brown, dull, the nerves fainter than on the upper, the midrib sharp and prominent; length 2·75 to 4 in.; breadth 1·5 to 2 in.; petiole ·25 to ·3 in. *Panicles* terminal, 1·5 in. long, not pedunculate, branching from the base; the branches short, thick, slightly compressed and slightly 4-angled. *Flowers* in twos or threes at the ends of the branchlets, about ·5 in. long (including the stamens), white, clavate in bud, some sessile and others on very short, stout pedicels. *Calyx* ·25 in. long, funnel-shaped gradually tapering to the thick base; the mouth truncate. *Petals* 5, orbicular, calyptrate. *Fruit* unknown.

PERAK: *King's Collector* 3526.

Allied to *E. Prainiana*, but differing in the truncate calyx-limb, sessile panicles and thinner young branches the bark of which moreover is nearly white.

70. *EUGENIA LÉVICHAULIS*, Duthie in Hook. fil. Fl. Br. Ind. II, 492. A tree; young branches half as thick as a goose-quill, terete, very pale. *Leaves* coriaceous, oblong-lanceolate or oblong-elliptic, shortly and

abruptly acuminate, the base cuneate; upper surface dark-olivaceous (when dry) and shining, the midrib bold and depressed and the nerves not depressed but faint; lower surface chocolate-brown, dull, the numerous nerves and reticulations indistinct, the intramarginal line very close to the edge, faint; length 3·5 to 4·5 in.; breadth 1 to 1·6 in.; petioles ·2 to ·3 in. *Panicles* mostly terminal, but a few in the upper axils, condensed, much shorter than the leaves; branches few, crowded, very stout, obscurely 4-angled, shining. *Flowers* ·5 or ·6 in. long (including the stamens), in threes at the apices of the branchlets, the middle one on a short thick pedicel, the lateral pair sessile. *Calyx* ·25 in. long, campanulate, tapering regularly to the base; the mouth with 5 small, bluntly triangular teeth reflexed after flowering. *Petals* orbicular, much larger than the calyx-teeth, calyptrate. *Fruit* when ripe as large as a cherry, depressed at both ends, pulpy, the apex crowned by the small circular remains of the calyx. Duthie in Hook. fil. Fl. Br. Ind. II, 492 (in part). *E. inophylla*, ? in Wall. Cat. 3600 and not of Roxb.

MALACCA: Maingay Herb. prop. 3012 (K.D. 753 *in part*). PENANG: Wallich; Curtis 750, 666, 2246, 2247.

Hitherto collected only in Malacca and Penang. This is one of three plants issued doubtfully by Wallich as *E. inophylla*, Roxb.; and one of two issued from Herb. Kew, as 753 Maingay. There are in Herb. Kew, three Maingayan sheets under the distribution 753. Two of these bore the same number in Maingay's own collection, viz., 3012: the third, which is imperfect, bore his 1558, and is a different plant from his 3012 and is really *E. anisosepala*, Duthie. *E. laxicaulis* is allied to *E. oblata*, Roxb., but has more contracted panicles with much shorter branches, more oblong flower-buds, shorter stamens, more faintly nerved leaves which are usually smaller.

71. *EUGENIA GOODENOVII*, King n. sp. A tree, 50 to 70 feet high; young branches somewhat thicker than a crow-quill, terete, with compressed nodes, the bark dull pale yellowish-grey. *Leaves* coriaceous, oblong-elliptic, rarely somewhat lanceolate, the base much cuneate; the apex acute or sometimes shortly and bluntly acuminate; both surfaces rather dull when dry, yellowish-brown, the lower somewhat paler, the main-nerves many pairs, inconspicuous on either surface as are the secondary nerves and the reticulations; the intramarginal nerve faint, about ·1 in. from the edge; length 3·5 to 5·5 in.; breadth 1·5 to 2 in.; petioles ·2 to ·3 in. *Panicles* terminal and from the axils of a few of the upper leaves, 1·5 to 2 in. long and about as broad; the branches few, spreading, obscurely 4-angled. *Flowers* shortly pedicelled, (when expanded) from ·2 to ·3 in. across, the buds clavate from ·2 to ·3 in. long. *Calyx* funnel-shaped, the mouth with 4 broad, rounded lobes. *Petals* 4, sub-orbicular, calyptrate. *Fruit* broadly urn-shaped, the apex broad

and truncate, crowned in the middle by the short conical remains of the style, about .5 in. in diam. when dry and about .6 in. long, the base with a fleshy papilla and a short stout stalk. *Syz. rigidum*, Wall. Cat. 3581.

MALACCA: ?; Wallich; Goodenough 1759. SELANGOR: King's Collector 8741. DISTRIB.—Java.

Wallich's specimens of this are referred in the Flora of British India to *E. chlorantha*, Duthie. The better examples collected since Wallich's time by Messrs. Goodenough and Kunstler however shew this to be a distinct species, Wallich's specific name for which would have been retained but for the priority of DeCandolle's *Eugenia rigida*. This strongly resembles *E. Zippelliana*, Miq., as that species is represented at Kew.

72. *EUGENIA LINOCIEROIDEA*, King. A tree, 40 to 50 feet high; young branches when in flower as thick as a crow-quill (thicker when in fruit), dark-brown. *Leaves* coriaceous, lanceolate, shortly acuminate, the base cuneate; both surfaces of an olivaceous, leaden colour when dry, the upper very dark and shining, the nerves numerous, indistinct: the lower paler and dull, the nerves straight spreading, black, inter-arching less than .05 in. from the edge, the reticulations not prominent: length 2 or (rarely) 3 in.; breadth .6 to 1 in.; petioles .1 in. *Panicles* terminal, as long as the leaves when in flower (longer when in fruit), much branched, many-flowered, broader than long: main-branches sub-horizontal, somewhat 4-angled, the branchlets acutely so. *Flowers* .4 in. long (including the stamens), sessile, the buds clavate. *Calyx* .3 in. long, funnel-shaped, the lower half narrowed into a vertically ridged pseudo-stalk; the mouth with 4 deep, broad, rounded lobes. *Petals* 4, sub-orbicular, calyprate. *Fruit* oblong, with deep rugulose, vertical ridges, the apex crowned by the enlarged calyx-limb and its 4 inflexed teeth: length (unripe) .35 in.

PERAK: King's Collector 4580, 7980, 8094; Wray 1898, 2595.

73. *EUGENIA MYRTIFOLIA*, Roxb. Hort. Beng. 37; Fl. Br. Ind. II, 490. A shrub or small tree; young branches 4-angled, pale-brown, the older terete, greyish. *Leaves* thinly coriaceous, lanceolate to broadly ovate, shortly acuminate, the base acute: both surfaces shining, dotted, when dry brown, the lower paler; nerves close and numerous, thin but distinct on both surfaces; length 1.5 to 2.5 in.; breadth .75 to 1.35 in.; petiole .15 to .2 in. *Panicles* mostly terminal but a few from the upper leaf-axils, pedunculate, longer than the leaves; branches lax, spreading, corymbose, 4-angled. *Flowers* .3 in. long (including the stamens) sessile or pedicellate on the apices of the branchlets in twos or threes. *Calyx* .15 in. long, clavate, the mouth with 4 very narrow lobes or almost truncate. *Petals* 4, orbicular, calyprate. *Fruit* globular, piform, pulpy, bluish-black, smooth, crowned by the cupular, truncate calyx-

limb, 1-seeded. Duthie in Hook. fl. Fl. Br. Ind. II, 483; Wight III. II, 15; Ic. t. 618; Kurz in Journ. As. Soc. Beng. XLVI, Pt. 2, 67; For. Fl. I, 486. *Syzygium myrtifolium*, DC. Prodr. III, 261; Wall. Cat. 3571; Miquel Fl. Ind. Bat. 1, Pt. I, 456. *C. oleina*, Wight III. II, 15.

SINGAPORE: Wallich. PENANG: Wallich. PERAK: Wray 2703; King's Collector 8379.

74. *EUGENIA STAFFIANA*, King n. sp. A shrub, 2 to 6 feet high; young branches rigid, slender, 4-angled, the bark brown and deciduous in long flakes. *Leaves* very coriaceous, lanceolate or broadly elliptic tapering to the blunt sub-acute (occasionally rounded and retuse) apex, the base slightly cuneate or rounded; both surfaces olivaceous-brown when dry, the upper with large scattered pits, the lower paler, not dotted or pitted, nerves and reticulations very indistinct on both surfaces, the midrib distinct on the lower: length .5 to 1 in.; breadth .4 to .8 in.; petiole under .1 in. *Panicles* terminal, shorter than or as long as the leaves, few-flowered; the branches few, rigid, stout, square and with 4 thick wings. *Flowers* .3 in. long, with several bracteoles at their insertion on the short, stout, papillose pedicels. *Calyx* .15 in. long, narrowly campanulate, slightly inflated below the middle, ribbed and densely papillose externally, the mouth slightly expanded and with 4 or 5 spreading rounded teeth. *Petals* orbicular, free. *Stamens* about .15 in. long. *Fruit* sub-globular, crowned by the calyx lobes, white.

PERAK: *Scortechini* 336; Wray 216, 1582, 1619: at elevations of 5000 to 7000 feet.

This belongs to a group of dwarf montane species of *Eugenia* well-represented on the mountains of Ceylon and Southern British India and of which some species from the mountain of Kina Balu in Borneo have recently been described and figured in the Linnæan Transactions by Dr. O. Stapf. of the Kew Herbarium. The nearest ally of this is *E. kinabaluensis*, Stapf., from which this is distinguished by its larger inflorescence with winged branchlets, granular calyx-tube and pedicels, and less rotund leaves, entire (not retuse) at the apex.

75. *EUGENIA WRAYI*, King n. sp. A small tree; young branches obtusely 4-angled, brown (when dry) smooth, the older terete, rough, the bark grey. *Leaves* thickly coriaceous, broadly elliptic or sub-rotund the apex obtuse or sub-obtuse entire, not narrowed at the base: upper surface brown, the nerves and reticulations faint, the midrib depressed; lower surface pale sub-glaucous, the nerves and reticulations numerous and distinct, the midrib broad; length .75 to 1.35 in.; breadth .65 to 1.15 in.; petiole .1 in. or less. *Panicles* solitary, compact, terminal, in a short peduncle; its branches short and stout, slightly 4-angled, not winged or papillose. *Flowers* greenish, .35 in. long, (including the stamens) sessile in clusters of 3 or 4 at the ends of the branchlets, with a single deciduous bracteole at the base of each, the buds

shortly clavate. *Calyx* funnel-shaped, .15 in. long; not much narrowed to the base, smooth; the mouth with 5 unequal, broad rounded lobes. *Petals* calyptrate. *Stamens* short. *Fruit* unknown.

PERAK: at elevations of 5,000 to 7,000 feet; *Wray* 321, 1504, 3859; *Scortechini* 313.

This is another of the dwarf montane species. It resembles the Nilgiri *E. calophyllifolia*, Wight, very closely indeed and the differences between the leaves of the two can be appreciated only by comparison of actual specimens. The reticulations in the lower surface of this are finer and the enclosed spaces shorter. *E. calophyllifolia* has 4-merous flowers and the flowers of this are 5-merous. Fruit of this is at present unknown. From it, when found, a good character may, it is hoped, be obtained.

76. *EUGENIA SETOSA*, King n. sp. A shrub or creeper: young branches as thick as a crow-quill, dark-brown, densely clothed on the rachis and branches of the inflorescence with coarse subulate hairs mixed with brown scurf. *Leaves* thinly coriaceous, narrowly oblong-lanceolate, shortly and abruptly acuminate, the base rounded; upper surface (when dry) olivaceous with minute scattered black dots, the lower tinged with brown, minutely pustulate: nerves very numerous and close, sub-horizontal, interarching very near the slightly recurved minutely undulate edge; length 1.35 to 2.75 in.; breadth .4 to .85 in.; petiole under .1 in. *Panicles* axillary and terminal, about as long as the leaves, pedunculate, with spreading many-flowered branches. *Flowers* crowded on the branchlets, .4 in. long (including the stamens), clavate, the buds with globular apex abruptly contracted below, sessile or on short pedicels. *Calyx* campanulate above, contracted about the middle into a pseudo-stalk; the mouth truncate but with 5 small triangular deciduous lobes. *Petals* orbicular, deciduous. *Fruit* turbinate, crowned by the small truncate calyx-limb, minutely covered with pellucid, granule-like glands; length and breadth about .35 in.

PERAK: *Wray* 2704; *King's Collector* 5266, 6601, 6793.

77. *EUGENIA INASENSIS*, King n. sp. A small white-flowered tree; young branches thicker than a crow-quill, terete with compressed nodes; the bark pale and rather smooth. *Leaves* coriaceous, broadly elliptic to elliptic-oblong, sometimes slightly obovate, much tapered to the base, the apex with a short, abrupt blunt point, the edges recurved; when dry, the upper surface shining, pale yellowish-brown, the midrib depressed; the lower paler and dull, the midrib bold; main-nerves inconspicuous on both; length 2.5 to 4 in.; breadth 1.25 to 2.25 in.; petiole .2 to .4 in. *Panicles* much shorter than the leaves, terminal or from the upper leaf-axils, solitary or several together, pedunculate, usually 3-branched, the peduncle and branches dark-coloured, compressed. *Flowers* in threes, .3 to .4 in. in diam. when expanded, their

buds obovoid nearly .2 in. long. *Calyx* campanulate, sessile, not tapering into a pseudo-stalk, the mouth with 5 small rounded lobes, or truncate. *Petals* 5, orbicular-calyptrate. *Fruit* unknown.

PERAK: or Gunong Inas at elevations of about 5,000 feet; Wray 4144, 4150, 5154.

A species known only from Mount Inas. It is allied to *E. subdecussata*, Duthie, in many respects, but differs from that species in having petiolate leaves tapering much to the base and having recurved edges. The main nerves are, moreover, less distinct and the under surface is not dotted. The twigs also differ in being very pale in colour instead of brown.

78. *EUGENIA SUBDECUSSATA*, Duthie in Hook. fil. Fl. Br. Ind. II, 491. A tree or shrub; young branches sub-terete, compressed below the nodes, brown. *Leaves* sessile or nearly so, coriaceous, elliptic or oblong-elliptic, rarely somewhat obovate-elliptic, (sub-rotund in *VAR. montana*), tapering but little to either end, the apex sometimes with a short blunt acumen, the base minutely cordate; both surfaces dark-brown when dry, the upper polished; the lower slightly paler and pellucid-dotted; nerves numerous but not prominent on either surface, the midrib prominent on the lower; length 2 to 5.5 in.; breadth 1.35 to 3 in.; petiole very short or absent (about .1 in. long in *VAR. montana*). *Panicles* terminal, shorter than the leaves, pedunculate, the peduncle and all the branches and branchlets much compressed; the branches short, crowded. *Flowers* .35 in. long (including the stamens), sessile in heads on the apices of the branchlets; the buds shortly clavate. *Calyx* funnel-shaped, the mouth with 5 small triangular teeth. *Petals* calyptrate. *Fruit* globular, crowned by the small calyx-cup, smooth, .5 or .6 in. in diam. *Syzygium subdecussatum*, Wall. Cat. 3589 in part.

SINGAPORE: Wallich; Ridley 4662, 4814, 9498, 10389. MALACCA: Maingay (K.D.) 740; Derry 476, 975; Ridley 1985. PERAK: King's Collector; Scortechini; very common from the sea-level to elevations of 5,000 feet.

A species readily recognised by the elliptic polished leaves, tapering very little to either end, also by the compressed short branchlets of the inflorescence and the shortly clavate flowers.

VAR. colorata, King; panicle very condensed, flower-buds longer than in the typical form, leaves when dry tinged with red. *E. colorata*, Duthie in Hook. fil. Fl. Br. Ind. II.

MALACCA: Maingay (K.D.) 749.

Only a single specimen of this is known. It appears to me a form of *E. subdecussata*, and unworthy of specific rank.

VAR. montana, King; shrubby; leaves often sub-rotund or obovoid elliptic, from 1 to 2.5 in. long; panicles longer than the leaves.

PERAK: *Scortechini* 294; *Wray* 217, 3844. *King's Collector* 8030.

Syzygium apodum, Miq., a Sumatran species, closely resembles this but has thicker leaves with strongly recurved margins.

79. *EUGENIA PUNCTULATA*, King. A tree, 30 to 50 feet high; young branches thinner than a goose-quill, slightly compressed, the bark pale-brown, deciduous in flakes, and the older branches grey. *Leaves* coriaceous, obovate or oblanceolate, the apex broad and usually blunt but sometimes with a short point, much narrowed at the base, the edges slightly recurved; upper surface olivaceous (when dry), shining, the nerves indistinct; lower olivaceous-brown, the numerous straight nerves and reticulations faint; length 1·5 to 3 in.; breadth 1 to 1·75 in.; petiole ·2 to ·25 in. *Panicles* rather lax, terminal, longer than the leaves (often twice as long, especially in the fruiting stage): branches numerous, spreading, compressed or 4-angled, many-flowered. *Flowers* sessile at the apices of the branchlets with a few scarious bracteoles at their bases. *Calyx* campanulate, only ·1 in. long, its mouth obscurely 4-toothed, smooth. *Petals* deciduous. *Fruit* ovoid, much wrinkled when dry and crowned by the wide calyx-limb, ·4 in. long (unripe). *Syzygium punctulatum*, Wall. Cat. 3583. *Jambosa punctulata*, Miq. Fl. Ind. Bat. Suppl. 310.

SINGAPORE: *Wallich*. PERAK: *King's Collector* 3475, 3782, 6426, 6671, 6937, 10984; *Wray* 1125, 3972. SINGAPORE: *Ridley* 3893, 4988, 4989, 6540. MALACCA: *Derry* 1154. DISTRIB.—Borneo.

This is doubtfully referred in the *Flora of British India* to *E. pyrifolia*, Wall. The more complete specimens collected since that *Flora* was published show that *E. punctulata* is a perfectly distinct species.

80. *EUGENIA BRACTEOLATA*, Wight Ill. II, 15: Ic. t. 531. A tree, 30 to 60 feet high; young branches boldly 4-angled, pale-brown, about as thick as a goose-quill. *Leaves* coriaceous, oblong-obovate or oblanceolate, the apex broad and with a short blunt apiculus, rarely sub-acute, the base cuneate: when dry the upper surface dark-brown, shining, obscurely pitted, the nerves faint and impressed; the lower paler brown, neither pitted or dotted, the numerous pairs of horizontal nerves and the wide reticulations slightly distinct, the midrib very prominent; length 3 to 5 in.; breadth 1·5 to 2 in.; petiole ·3 to ·5 in. *Panicles* terminal, as long as the leaves, with small, ovate, concave bracteoles at all its nodes, corymbose, many-flowered, the branches few, the branchlets numerous and all (like the peduncle) acutely 4-angled and grooved. *Flowers* in threes at the apices of the branchlets: bibracteolate at the base and on short pedicels, ·3 in. long including the stamens, globular-clavate in bud. *Calyx* ·15 in. long, shortly infundibuliform, rugulose, the mouth with 4 rounded lobes. *Petals* whitish, calyptrate. *Fruit*

oblong, tapering to each end, the apex crowned by the 4 persistent calyx-teeth, minutely rugulose, length (*very unripe*) .25 in. Kurz in Journ. As. Soc. Beng. XLVI, Pt. 2, 66; For. Flora Burm. I, 482; Duthie in Hook. fil. Fl. Br. Ind. II, 488.

MALACCA: *Maingay* (K.D.) 770. PENANG: *Curtis* 1089, 3175. PERAK: very common. DISTRIB.—Burma: *Griffith* (K.D.) 2387; *Helper* (K.D.) 2386, 2373.

Easily recognised by its profusely bracteolate inflorescence and acutely 4-angled branches and panicle. *Curtis's* 1089 is when dry of a much paler colour than the Perak specimens, otherwise it agrees.

81. *EUGENIA VENULOSA*, Wall. in Cat. ex Duthie in Hook. fil. Fl. Br. Ind. II, 490. A tree, 20 to 25 feet high; young branches thicker than a crow-quill, terete, pale. *Leaves* coriaceous, elliptic-rhomboid to oblanceolate, the apex obtuse or sub-acute, the base cuneate; upper surface pale-brown often with an olivaceous tint (when dry), dotted, shining, duller, the nerves faint; under surface paler, and not olivaceous, the main-nerves 10 to 14 pairs, rather straight, sub-erect, not much more prominent than the secondary nerves, both sets connected by numerous loops, the intramarginal nerves about .1 in. distant from the slightly recurved edge; length 2 to 3 in.; breadth .8 to 2.2 in.; petiole .1 to .15 in. *Panicles* terminal, broadly corymbose, much-branched, usually shorter or not much longer than the leaves (longer in VAR.); peduncle and branches 4-angled, the flowers in threes at the apices of the branchlets, clavate in bud, sessile. *Calyx* .2 in. long, rugulose, campanulate in its upper half, the lower contracted, the mouth truncate, or slightly lobed. *Petals* calyptrate. *Fruit* globular, submamillate, the apex with a deep, circular, entire pit bounded by the calyx-walls, .5 in. in diam.

MALACCA: *Griffith* (K.D.) 2405; *Maingay* (K.D.) 741. SINGAPORE: *Wallich*; *Ridley* 5985. JOHORE: 4986. PERAK: *Scortechini* 188; *Wray* 3016.

VAR. *macrothyrsa*; *panicles* longer than the leaves and as much as 4 in. broad.

MALACCA: *Griffith* (K.D.) 2405; *Derry* 21; *Maingay* (K.D.) 719. JOHORE: *Ridley* 4196. PERAK: *Scortechini* 188.

82. *EUGENIA PSEUDO-SUBTILIS*, King. A tree, 30 or 40 feet high; young branches pale greyish-yellow, or almost white, slightly thicker than a crow-quill, terete. *Leaves* very coriaceous, narrowly oblong-elliptic tapering from the middle to each end, the apex sub-acute or obtuse, the base cuneate; both surfaces when dry dull, pale-brown; the upper pellucid-pitted and the nerves faint; the lower paler not pitted, the midrib prominent but the 5 to 7 pairs of main-nerves faint, sub-erect, curved, not interarching near the edge, length 2.25 to 4 in.;

breadth 1·1 to 1·25 in. petiole ·5 to ·75 in. *Panicles* shorter than or nearly as long as the leaves, axillary and terminal, often 2 or 3 together, few-branched; the branches divaricate, 4-angled, few-flowered, trichotomous. *Flowers* sessile, small. *Calyx* only ·05 in. long, at first almost cylindric slightly narrowed to the base, afterwards urn-shaped and finally globular, the mouth with a projecting rim, truncate but with 4 broad, shallow teeth. *Fruit* the size and shape of a pepper-corn, smooth, surmounted by the small remains of the calyx and by the base of the style. *E. brachiata*, Duthie (not of Roxb.) in Hook. fil. Fl. Br. Ind. II, (*in part*).

PENANG: *Curtis* 3475. PERAK: *King's Collector* 6946. SINGAPORE: *Ridley* 4990.

VAR. *platyphylla*; leaves broader than in the typical form, elliptic, oblanceolate-oblong, sub-acute or with broad rounded apex, the base always cuneate.

SINGAPORE: *Ridley* 3962. MALACCA: *Derry*; *Scortechini*. PERAK: PENANG: *Curtis* 32. *Syzyg. ribesoides*, Wall. Cat. 3553. *Syzyg. cinereum*, Wall. Cat. 3576.

VAR. *subacuminata*; leaves bluntly acuminate.

PENANG: *King's Collector* 1793.

This species closely resembles *S. subtile*, Miq., in its pale branches, in the shape and texture of its leaves and in its flowers. The leaves however have only about one-third as many nerves. The two are however very near.

83. *EUGENIA MICROCALYX*, Duthie in Hook. fil. Fl. Br. Ind. II, 493. A tree, 40 to 50 feet high; young branches slender, 4-angled, brown. *Leaves* coriaceous, oblong-obovate or oblong-lanceolate, sub-acute, much narrowed from the middle to the base; upper surface blackish-brown when dry, the nerves faint: lower warm-brown the nerves and midrib prominent: main-nerves 10 to 14 pairs, rather straight, ascending, interarching ·15 in. from the edge in a bold wavy line; the edges much and irregularly recurved when dry; length 2·25 to 3·5 in.; breadth 1·25 to 2 in.; petiole ·25 to ·3 in. *Panicles* terminal and axillary, as long as or longer than the leaves, on long slender peduncles; branches and branchlets lax, spreading, compressed, with minutely triangular persistent bracteoles at their bases. *Flowers* yellowish-white, sessile, in heads at the ends of the branchlets, small (only ·2 in. long including the stamens), bracteolate at the base. *Calyx* ·15 in. long, funnel-shaped, minutely granular; the mouth with 4 small distant triangular lobes. *Petals* 4, calyptrate. *Fruit* (probably unripe) as large as a pepper-corn, globular, crowned by the wide calyx-limb, white tinged with red.

MALACCA: *Griffith* (K.D.) 2410 (*in part*), 2411. *Derry* 3531; *Main-gay* (K.D.) 727, 731. SINGAPORE: *Ridley* 2054. PERAK: *King's Collector* 5986, 5990, 6627, 8129, 8700, 10417, 10735.

VAR. *obovata*; leaves obovate or obovate-lanceolate.

PERAK: King's Collector 6627, 10417, 8129, 8700, 5990, 5986, 8700.

84. *EUGENIA SCOPARIA*, Wall. Cat. 3594. A tree? Young branches about as thick as a crow-quill, terete, pale-brown, smooth. Leaves coriaceous, oblanceolate to obovoid, occasionally elliptic-lanceolate, the apex sub-acute or obtuse, the base always cuneate; upper surface brown and with numerous small pits, the lower paler and with numerous minute black glands, midrib depressed on the upper and prominent on the lower surface, the nerves almost invisible on both; length 1.25 to 2.25 in.; breadth .6 to 1.1 in. Panicles terminal and from the upper leaf axils, longer than the leaves, on slender, rather long, 4-angled peduncles bearing near the apex a few divaricate laxly-flowered branches. Flower-buds clavate, about .15 in. long; mouth of calyx wide, shortly 4-lobed, the tube short and abruptly contracted at the base. Fruit almost globular with a truncate apex, smooth, .1 in. in diam. Duthie in Hook. fil. Fl. Br. Ind. II, 489. *Syzygium scoparim*, Wall. MSS. ? *S. avene*, Miq. Fl. Ind. Bat. Suppl. I, 312.

SINGAPORE: Wallich. MALACCA: Goodenough 1649.

Specimens of a species nearly allied to this were collected at Changi in Singapore by Mr. Ridley in October 1890 and again at Selangor (Herb. 7555) in 1896. They differ in having the leaves broader, more pronounced obovate, and almost without dots or glands.

85. *EUGENIA MYRIANTHA*, King n. sp. A tall tree; young branches slightly thicker than a crow-quill, terete. Leaves very coriaceous, oblanceolate sub-acute, the base much narrowed; when dry upper surface pale-brown, shining, dotted; the lower darker brown, dull, sub-glaucous; nerves 3 or 4 pairs, on each side very faint, distant, ascending; reticulations on both surfaces invisible, the edges slightly recurved; length 1 to 1.75 in.; breadth .5 to .75 in.; petiole .25 to .3 in. Panicles very numerous, longer than the leaves, terminal or in the upper axils, pedunculate; branches numerous, spreading, the branchlets quadrangular and bearing at their apices numerous small sessile flowers with broad rounded bracteoles at their bases. Flowers only .1 in. long, truncate in bud. Calyx cylindric, the mouth very obscurely lobed. Fruit unknown.

PERAK: *Scortechini* 337.

A species resembling *E. microcalyx*, Duthie, in its inflorescence and very small flowers and also in the character of the venation of the leaves which however are much smaller.

86. *EUGENIA VERECUNDA*, Duthie in Hook. fil. Fl. Br. Ind. II, 496. A small tree; young branches as thick as a crow-quill, pale yellow, terete, smooth. Leaves thinly coriaceous, ovate, acuminate, the base

broadly cuneate; upper surface brown when dry, shining; the lower very pale brown, dull; the numerous nerves, reticulations and intramarginal nerve rather distinct on both surfaces but especially on the upper when dry; length 2 to 3 in.; breadth .75 to 1.5 in.; petiole .35 to .6 in.; slender. *Panicles* crowded at the apices of the branches and in one or two of the upper leaf-axils, shorter than the leaves, on short peduncles, the branches slender, lax, 4-angled. *Flowers* only .15 in. long, sessile or on short pedicles, clavate, constricted immediately below the turbinate apex. *Calyx-tube* somewhat ribbed, the wide mouth with 4 shallow distant lobes. *Petals* calyptrate. *Fruit* unknown. *Syzygium verecundum*, Wall. Cat. 3579.

MALACCA: *Griffith*. PENANG: *Wallich*. SINGAPORE: *Ridley* 9486. PANGKORE: *Scortechini* 163.

87. *EUGENIA SWETTENHAMIANA*, King n. sp. A tree, 60 to 70 feet high; young branches thinner than a goose-quill, terete, very pale, faintly striate. *Leaves* thickly membranous, elliptic-oblong to obovate-lanceolate narrowed to the rounded base, the apex shortly and bluntly acuminate; upper surface dark-brown the nerves and midrib impressed; lower surface pale-brown, the midrib and main-nerves prominent; the latter 9 to 12 pairs curved and interarching to form a stout intramarginal nerve .1 in. from the margin, the reticulations indistinct on both surfaces; length 3.5 to 4 in.; breadth 1.2 to 1.75 in.; petiole .25 to .35 in. *Panicles* several together at the ends of the branches, as long (with their peduncles) as the leaves or longer, each bearing near its apex a few slender 3-flowered umbellate branches, the branchlets, peduncle-branches and branchlets compressed and 4-angled. *Flowers* greenish-white, .35 in. across when expanded; the buds before expansion clavate, .2 in. long. *Calyx* funnel-shaped, sessile, contracted at the base, its mouth with 4 broad, rounded, deciduous lobes. *Petals* 4, sub-orbicular, free, as large as the calyx-lobes. *Stamens* short. *Fruit* unknown.

PERAK: *Scortechini*; *King's Collector* 7590.

A species near *E. pseudo-subtile*, King, but with oblanceolate leaves and long slender pedunculate umbellate panicles crowded at the apices of the twig. Named to commemorate the help afforded in the Botanical exploration of Perak by Sir Frank Swettenham, K.C.M.G.

88. *EUGENIA ACUMINATISSIMA*, Kurz in Journ. As. Soc. Beng. XLVI, Pt. 2, 67; Fl. Br. Burm. I, 487. A tree, 20 to 50 feet high; young branches about as thick as a crow-quill, slightly compressed, the bark pale-brown, peeling off in vertical flakes. *Leaves* coriaceous, lanceolate or oblong-lanceolate, the apex caudate-acuminate, the base cuneate; both surfaces pale-brown when dry, the upper tinged with olivaceous, shining, the midrib depressed, the main-nerves 15 to 20 pairs, slightly raised, faint; lower surface darker than the upper, the

nerves faint, the intramarginal line rather less than .1 in. from the edge; length 2.5 to 4 in.; breadth .9 to 1.4 in.; petiole .2 to .25 in. *Panicles* usually large, lax, many-branched, pedunculate, longer than the leaves, mostly terminal but some also from the upper leaf-axils: branches acutely 4-angled, the upper also compressed. *Flowers* numerous, small, white, sessile, usually in threes from the ends of the branchlets, .2 in. long (including the stamens). *Calyx* turbinate-clavate, nearly .2 in. long, the lower half contracted, the upper part turbinate its mouth truncate or very obscurely toothed. *Petals* 5 or 6, minute, rotund, clawed, erose, free. *Fruit* depressed-globular, crowned by the minute circular remains of the calyx, .4 to .5 in. broad and about .35 to .4 in. long. Duthie in Hook. fil. Fl. Br. Ind. II, 483. *Jambosa acuminatissima*, Hassk. in Flora (1849), 592; Miq. Fl. Ind. Bat. I, 438. *Syzyg. altissimum*, Wall. Cat. 3588. *Myrtus acuminatissima*, Blume Bijdr. 1088.

In all the Provinces except the Nicobar Islands. **DISTRIB.**—Burma, Sumatra.

89. *EUGENIA KUNSTLERI*, King n. sp. A tall tree; young branches thinner than a goose-quill, terete, pale. *Leaves* thinly coriaceous, ovate-lanceolate, acuminate, much narrowed at the base: upper surface brown (when dry), with small depressed dots, the nerves indistinct: lower pale-brown with numerous small black dots: main-nerves bold on the under surface, 8 to 10 pairs, curving upwards and interarching .1 to .15 in. from the edge; length 3.5 to 5.5 in.; breadth 1.5 to 2.25 in.; petiole .4 to .5 in. *Panicles* terminal or from the upper leaf-axils, much shorter than the leaves; the short peduncle and the numerous spreading branches 4-angled, with many small pustules, minutely bracteolate at the divisions. *Flowers* small, numerous, greenish-yellow, in threes at the apices of the branchlets, sessile. *Calyx* .1 in., funnel-shaped, the mouth with 4 obscure broad teeth. *Petals* orbicular. *Fruit* ovoid, contracted somewhat at the base and crowned by the short wide calyx-limb, smooth, .5–.6 in. long.

PERAK: King's Collector 3310, 3680. **PENANG:** Curtis 179.

A species of which the nearest allies are *E. pustulata*, Duthie, and *E. brachiata*, Roxb., but with more slender panicles and smaller flowers than the former and more acuminate leaves than the latter. It also resembles *E. minutiflora*, Miq., but that has broadly ovate shortly acuminate leaves and shorter panicles.

90. *EUGENIA PUSTULATA*, Duthie in Hook. fil. Fl. Br. Ind. II, 495. A tree, 20 to 50 feet high; young branches thinner than a goose-quill, terete, pale-brown, minutely warted. *Leaves* coriaceous, oblong or oblong-lanceolate, shortly acuminate, much narrowed to the base: upper surface (when dry) smooth, shining, greenish, the nerves usually

indistinct; the lower brown with many minute papillæ especially on the prominent midrib; main-nerves 10 to 14 pairs, curving upwards and interarching $\cdot 1$ in. from the margin, pale, and prominent on the lower surface; length 4.5 to 7 in.; breadth 1.35 to 2.25; petiole $\cdot 3$ to $\cdot 4$ in. *Panicles* small, several together, shorter than the leaves, terminal or from the upper leaf-axils, branching from the base, the branches spreading, papillose, stout, 4-angled. *Flowers* few, sessile, $\cdot 25$ in. long (including the stamens), truncate in bud. *Calyx* campanulate, minutely papillose externally; the mouth wide and with 4 short, broad, sub-acute lobes. *Petals* calyptrate. *Fruit* globular, the apex with a circular pit surrounded by the wide, short, cupular remains of the calyx, smooth, $\cdot 4$ to $\cdot 5$ in. in diam.

MALACCA: *Maingay* (K.D.) 751. SINGAPORE: *Ridley* 4657, 4979, 6420, 6421. PERAK: *King's Collector* 3724, 6758, 7536.

A species recognisable by its short stout panicles with short widely campanulate flowers, and pustulate stems and panicles. The leaves (when dry) are distinguished by their colour, greenish above and brown beneath.

91. *EUGENIA KOORDERSIANA*, King n. sp. A tree, 40 to 80 feet high; young branches somewhat thicker than a crow-quill, terete, dark purplish-brown when dry. *Leaves* coriaceous, elliptic or narrowly ovate, rarely oblanceolate, shortly caudate-acuminate, the base cuneate; both surfaces (when dry) very dark brown, the lower slightly paler; main-nerves 8 to 10 pairs, curving slightly and interarching $\cdot 1$ in. or more from the edge, impressed on the upper surface slightly prominent on the lower; length 2.75 to 3.75 in.; breadth 1 to 1.75 in.; petiole about $\cdot 3$ in. *Panicles* terminal, usually much longer than the leaves, corymbose, many-branched, the peduncle and branches sharply 4-angled, compressed at the nodes; branchlets 3- to 5-flowered at the apex. *Flowers* white, clavate in bud, sessile. *Calyx* campanulate, 4-angled, $\cdot 15$ in. long, contracted for half its length into a pseudo-stalk; the mouth with 4 deep, broad, rounded lobes. *Petals* 4, sub-rotund, calyptrate. *Fruit* unknown.

PERAK: *Scortechini* 257; *King's Collector* 6208, 6233, 6385.

When dry the leaves and panicles of this are very dark-coloured. It is allied to *E. pseudo-subtilis* and *E. Clarkeana*, but differs from both in leaves. I have named it in honour of Dr. S. H. Koorders of the Forest Dept. in Netherlands India.

92. *EUGENIA SIMULANS*, King n. sp. A tree, 30 to 40 feet high, with pendulous branches: young branches terete, the very youngest compressed and about as thick as a crow-quill, brown. *Leaves* thinly coriaceous, oblong or elliptic-lanceolate, shortly and rather bluntly acuminate, the base cuneate; both sides dark-brown and shining when dry, the lower paler and duller, slightly olivaceous; nerves numerous,

straight, inconspicuous like the reticulations, intramarginal nerve very near the edge; length 4·5 to 5·5 in.; breadth 1·75 to 2·25 in.; petiole ·3 to ·4 in. *Panicles* mostly axillary, sometimes terminal, 3 to 4 in. long, pedunculate, pyramidal, the branches nearly horizontal, all terete. *Flowers* mostly in threes at the apices of the branchlets, sessile, clavate in bud. *Calyx* nearly ·15 in. long, obconic, with a sub-obtuse base; the mouth thickened, undulate, indistinctly 5-toothed. *Petals* calyptrate. *Stamens* unequal. *Fruit* unknown.

PERAK: *Scortechini* 83, 274.

This resembles *E. Bernardi*, King, but differs in having clavate, not shortly obovoid, flower-buds, and in its panicles being usually lateral not terminal. The leaves of the two are much alike. Ridley's specimens collected in the garden jungle (8104 and 9845) probably belong to this but the panicle is laxer and its branches thinner.

93. *EUGENIA CURTISII*, King n. sp. A tree, 60 to 80 feet high; young branches thinner than a goose-quill, terete, the bark brown and peeling off in flakes. *Leaves* coriaceous, oblong-lanceolate or oblong-elliptic, rarely oblanceolate, the apex shortly and bluntly acuminate, the base cuneate, the edges slightly recurved when dry, both surfaces when dry pale olivaceous-brown, shining, obscurely pustulate, the lower less shining and darker in colour than the upper and with numerous very distinct minute conical concolorous pustules; the midrib depressed on the upper but prominent and pustulate on the lower surface; main and secondary nerves numerous, spreading, interarching less than ·1 in. from the slightly recurved edge, rather distinct on the lower but faint on the upper surfaces; length 3 to 5·5 in.; breadth 1 to 2 in.; petioles ·15 to ·2 in. *Panicles* terminal, from half as long as to as long as the leaves, branched from the base, dense, many-flowered, broader than long, the main-branches spreading, terete, the secondary and tertiary acutely 4-angled, all stout, the bark very granular, ultimately flakey. *Flowers* crowded at the ends of the branchlets, ·2 in. long (including the stamens), sub-globose in bud. *Calyx* campanulate, narrowed to the base and produced into a short pseudo-stalk, granular, shining: the mouth wide, with 5 small, broadly triangular teeth. *Petals* 5, papillose outside, orbicular, ? calyptrate. *Fruit* unknown.

PERAK: *Wray* 2968, 3102; *King's Collector* 6149.

VAR. *minor*; flowers smaller (rather less than ·2 in. long, including the stamens): *Calyx* not produced into a pseudo-stalk, its mouth obscurely lobed: leaves 2·5 to 3 in. long.

PERAK: *Wray* 194. MALACCA: *Harvey*.

94. *EUGENIA OPERCULATA*, Roxb. Hort. Beng. 37; Fl. Br. Ind. II, 486. A tree, 30 to 50 feet high; young branches slightly compressed, dotted and grooved at first, afterwards terete, the bark pale-brown at first but

ultimately grey. *Leaves* thinly coriaceous, variable in shape, ovate-oblong to elliptic and (in VAR. 2) obovate, shortly acuminate, bluntly apiculate or (in VAR. 2) obtuse, the base cuneate; both surfaces olivaceous when dry, the lower paler and minutely dotted: main-nerves distinct on the lower surface, 8 to 12 pairs, curved, ascending, becoming faint towards the intramarginal nerve: length 4 to 6 in.; breadth 1·6 to 2·2 in.; petiole 2 to 3 in. *Panicles* from the branches below the leaves, 2 or 3 inches long, pedunculate, spreading, lax; the branches divaricate, trichotomous, 4-angled. *Flowers* in threes at the apices of the branchlets, greenish, sessile. *Calyx* smooth, campanulate, contracted at the base; the limb truncate. *Petals* 4, calyptrate, orbicular, concave, about 1 in. across. *Fruit* pisiform, smooth, very dark purple, pulpy, 1-seeded. Wight Ic. t. 552; Brandis For. Fl. 234; Kurz For. Fl. I, 483; Duthie in Hook. fil. Fl. Br. Ind. II, 498. *E. cerasoides*, Roxb. Hort. Beng. 92; Fl. Ind. II, 488; Wight Ic. t. 615; Miq. Anal. Bot. Ind. I, 27; Fl. Ind. Bat. I, Pt. 1, 443; Kurz in Journ. As. Soc. Beng. XLVI, Pt. 2, 66; For. Fl. I, 484. *Syzygium nervosum*, DC. Prodr. III, 260; Mem. Myrt. II, 16; Wall. Cat. 3551 A & B; 3553 B & C (under *E. ribesoides*); Benth. Fl. Hongk. 119; Thwaites Enum. 417; Miq. Fl. Ind. Bat. l.c. 460; Bedd. Fl. Sylv. Anal. Gen. CVI. *S. costatum*, *nodosum*, and *angolanum*, Miq. Fl. Ind. Bat. l.c. 448. *Calyptranthes mangiferifolia*, Hance in Walp. Ann. II, 629. *C. costata*, Ham. in Wall. Cat. 3556. *C. grandis* and *C. Tatna*, Ham. in Wall. Cat. 3554, 3555.

PERAK: *Scortechini* 306. PENANG: *Curtis* 1444. DISTRIB.—British India, S. China and the Malay Archipelago.

Two varieties have been separated off but I have no specimens of either from any of the Provinces in our region. These are described as follows by Mr. Duthie in Hooker's Flora of British India.

VAR. *Paniala*; berries oval. *E. Paniala*, Roxb. Fl. Ind. II, 489; Wight Ic. t. 616; Kurz For. Fl. I, 483. *Syz. Panealla*, Wall. Cat. 3557? *Calyptranthes cuneata*, Ham.?

VAR. *obovata*, Kurz For. Fl. I, 482; leaves obovate or oblanceolate, cymes more compact. *Syz. obovatum*, Wall. Cat. 3552, not of DC. *S. vastum*, Wall. Cat. 3661. *S. polyanthum*, Thwaites; not of Wight.

A third variety occurs in Perak but it has as yet been only once collected: It may be distinguished as follows.

VAR. *coriacea*; leaves thicker than in the type and not dotted or very obscurely dotted on the lower surface.

PERAK: *Wray* 2725, at Matong on the sea-coast.

95. *EUGENIA NICOBARICA*, King. A tree? Young branches rather thinner than a goose-quill, terete, somewhat rough, grey. *Leaves* thinly coriaceous, lanceolate or elliptic, the apex sub-acute, the base cuneate;

both surfaces (when dry) olivaceous-brown, the upper shining, with the midrib and main-nerves depressed; the lower paler and dull; main-nerves 5 to 8 pairs, faint on both surfaces; reticulations few, faintly visible on the lower invisible on the upper surface; length of the lanceolate form 2·5 to 3 in., of the elliptic form 3 to 4·5 in.; breadth respectively 1 to 1·5 in. and 1·5 to 2·5 in.; petiole ·6 to ·8 in. *Panicles* numerous, crowded on the branches below the leaves, trichotomous, 1 to 2 in. long, with a few divaricating, few-flowered branches. *Flowers* in threes at the ends of the branchlets, ·25 in. long (including the stamens), sessile or on short, stout 4-angled pedicels, obovoid in bud. *Calyx* ·1 in. long, lengthening to ·2 in. after fertilization, campanulate with a 4 in. wide, truncate, irregularly toothed thickened mouth, much narrowed to the base but not constricted into a pseudo-stalk. *Petals* 4 orbicular, calyptrate. *Fruit* unknown. *E. occlusa*, Kurz in Hook. fil. Fl. Br. Ind. II, 498 (not of Miquel).

NICOBAR ISLANDS: Kurz.

This has been collected only in the Nicobar islands and there only by Kurz who referred it to *Syzygium occlusum*, Miq. But it differs so much from an authentic specimen of that species in the Horsfield collection and from Miquel's own description, that I have given it a new name.

96. *EUGENIA JAMBOLANA*, Lamk. Dict. III, 198. A small tree; young branches thinner than a goose-quill, terete, very pale when dry. *Leaves* coriaceous, rather variable, rotund-ovate to oblong-ovate, bluntly and shortly acuminate, sub-acute or obtuse, slightly narrowed at the base; both surfaces brown when dry, the under paler; nerves and their connecting reticulations numerous, distinct when dry on both surfaces but especially on the lower, intra-marginal nerve and midrib prominent on the lower; length 2·5 to 4 in.; breadth 1·5 to 2·25; petiole ·6 to ·75 in. *Panicles* from the branches below the leaves, much branched; the branches divaricate, all terete, many-flowered, longer than the leaves. *Flowers* whitish, sessile, ·4 in. across. *Calyx* campanulate, suddenly contracted into a stout pseudo-stalk less than half its length, the limb at first obscurely and broadly 4-toothed but ultimately truncate. *Petals* 4, orbicular, rather more than ·1 in. long, calyptrate. *Fruit* ovoid-oblong, about the size of an olive, pulpy, smooth, dark-purple, 1-seeded. Ham. in. Wern. Soc. Trans. V, 342; Roxb. Fl. Ind. II, 484; Wight Ic. t. 535; Benth. Fl. Austral. III, 283; Bedd. Fl. Sylv. I, t. 197; Brandis For. Fl. 233; Kurz in Journ. As. Soc. Beng. XLVI, Pt. 2, 67; For. Fl. I, 485. Duthie in Hook. fil. Fl. Br. Ind. II, 499. *Syz. Jambolanum*, DC. Prodr. III, 259; Wall. Cat. 3560; W. and A. Prodr. I, 329; Dalz. and Gibs. Fl. Bomb. 93. *E. frondosa*, Wall. Cat. 3560 G: not 3590. *E. Moorei*, F. Muell. Fragm. V, 33. *Calyptranthes Jambolana*, Willd. Sp. Pl. II, 975. *C. capitellata*,

Ham. in Wall. Cat. 3560 B. *E. caryophyllifolia*, Lam. Dict. III, 198; Roxb. Hort. Beng. 37; Fl. Ind. II, 486; Wight Ic. II, 553. *E. calyptrata*, Roxb. Ic. 1142? *Syz. caryophyllifolium*, DC. Prodr. III, 259; Wall. Cat. 3562 partly, and 3551, C.; Thwaites Enum. 116. *S. Jambolanum*, var. *microcarpum*, Thwaites Enum. 417; Wall. Cat. 3562 C. *Syz. lateriflorum*, Royle. *Myrtus Cumini*, Linn.: exclude syn. Rumph. and Burm.—Pluk. Alm. t. 274, 2. Rheede Hort. Mal. V, t. 29. Rumph. Herb. Amb. I. t. 41. *E. obtusifolia*, Roxb. Hort. Beng. 37; Fl. Ind. II, 485; Wight Ic. t. 620. *Jambolifera pedunculata*, Gaertn. Fruct. I, 78, t. 36.—Rumph. Herb. Amb. I, t. 42; (bad).

Not uncommon in cultivation in all the provinces and also in British India but rarely wild in any of the Malay provinces. The fruit although rather austere is eaten.

SPECIES OF DOUBTFUL POSITION.

The under-noted three species were described by Mr. Duthie in Hooker's Flora of British India. They are all founded on scanty specimens collected by Maingay. I quote the author's descriptions *verbatim*.

E. fusiformis, Duthie; young branches 4-gonous, leaves petioled obovate-lanceolate cuneate below subcoriaceous pellucid-punctate, lateral nerves rather close, cymes terminal compact branches angular and somewhat winged, flowers 2 or 3 together on short pedicels, calyx-tube narrowly fusiform much produced above the ovary.

MALAYA: Maingay 743.

Bark yellowish. *Leaves* $4\frac{1}{2}$ by 3 in., shining a little above, minutely dotted; midrib and nerves dark-coloured; lateral nerves uniting within the margin; petiole about $\frac{3}{8}$ in. *Calyx-tube* $\frac{1}{2}$ in. in length and $\frac{1}{2}$ in. across at the widest part; lobes 4, rounded, reflexed after flowering. *Style* persistent, exerted portion equalling the calyx-tube.—Closely allied to 2236 of Beccari's Borneo plants.

E. maingayi, Duthie; leaves shortly petioled long oblong-lanceolate acuminate rounded at the base, racemes short axillary or from the leafless axils of the rugged lower branchlets, calyx-tube elongate clavate about $\frac{2}{3}$ in. glandular, lobes 4 rounded deciduous.

MALAYA: Maingay 750.

Older branchlets with rugged corky bark, upper stout, terete, reddish. *Leaves* $4\frac{1}{2}$ – $7\frac{1}{2}$ by $1\frac{3}{4}$ – $2\frac{1}{4}$ in., indistinctly nerved above, midrib stout beneath; petiole $\frac{1}{2}$ in. *Style* short, acute.—This plant seems to approach nearest to *E. claviflora*, and has a general resemblance to *E. borneensis*, Miq. Fl. Ind. Bat. I, Pt. 1, 434 (*Jambosa*), but the petioles of the latter are much longer.

E. tumida, Duthie; leaves oblong-ovate or obovate shortly acuminate narrowed at the base closely nerved, cymes terminal and axillary equalling or exceeding the leaves, calyx-tube $\frac{3}{10}$ in. narrow swollen below the middle.

MALACCA: Maingay 755.

Branchlets terete. *Leaves* $2\frac{1}{2}$ – $3\frac{1}{2}$ in., chocolate-coloured above, rusty-yellow beneath when dried; lateral nerves slender, uniting close within the margin; petiole $\frac{1}{4}$ in. *Panicles* lax, spreading; branches acutely angular. *Calyx* with 4 nearly equal shallow lobes.—The *petals* are probably free, though not expanding. The swollen part of the calyx-tube is occupied by the ovary.

9. PSEUDO-EUGENIA, Scortechini.

Trees with opposite punctate leaves and few-flowered, axillary, minutely bracteolate inflorescence. *Calyx-tube* turbinate or oblong, its mouth with 4 small rounded lobes, and bearing a thin annular stamiferous disc. *Petals* 4, orbicular, clawed. *Stamens* 8, in two rows; filaments inflexed in bud; *anthers* small, 2-celled. *Ovary* 2-celled. *Style* short. *Ovules* numerous, in several series on the placentas. *Fruit* as in *Eugenia*, 1- to 2-seeded. **DISTRIB.**—2 species, both Malayan.

A genus which differs from *Eugenia* chiefly in having only 8 stamens.

Leaves 4·5 to 6 in. long

1. *P. perakensis*.

„ 1·5 to 2·5 in. long

2. *P. singaporensis*.

1. PSEUDO-EUGENIA PERAKENSIS, Scortechini in Journ. Bot. XXIII (1885), 153. A tree, 15 feet high; young branches thin, terete. *Leaves* thinly coriaceous, elliptic-lanceolate, slightly narrowed at the base, the apex with a slender obtuse acumen, pellucid-punctate, the main-nerves close, inconspicuous on the upper surface, sub-horizontal, interarching near the margin; length 4·5 to 6 in.; breadth 1·5 to 2 in.; petioles short. *Calyx-lobes* incurved. *Petals* 4, small, free, spreading, distant. *Stamens* short. *Berry* pisiform. *Eugenia skiophila*, Duthie in Hook. fl. Fl. Br. Ind. II, 486.

PENANG: Maingay. PERAK: Scortechini.

2. PSEUDO-EUGENIA SINGAPORENSIS, King n. sp. A tree, 30 to 40 feet high; young branches as thin as a crow-quill or thinner, terete, smooth, dark-brown. *Leaves* thinly coriaceous, elliptic-lanceolate, slightly narrowed at the base, the apex abruptly and bluntly acuminate; both surfaces (when dry), dull and of a uniform dark-brown colour; the upper with the midrib depressed and the main-nerves and reticulations obscure; the lower minutely warted; the main-nerves numerous, faint, interarching near the edge; length 1·5 to 2·5 in.; breadth 4·5 to 7 in.; petioles 1 to 1·5 in. *Panicles* shorter than the leaves, axillary, few-branched and few-flowered; the peduncle and branches very slender, dark coloured, 4-angled. *Flowers* clavate in bud and greenish. *Fruit* unknown.

SINGAPORE: Ridley 2909; King's Collector 1242, 5957, 8710.

NOTE.

In addition to the two species above described there are in the Calcutta Herbarium specimens of what appears to be a third species of this genus collected by Mr. Harvey near Malacca. In these specimens the leaves are ovate with acute apices and cuneate bases, and 5 to 7 pairs of ascending main-nerves rather prominent on the lower surface. The leaves are from 3 to 4 inches long and about half as much in breadth. The flowers measure about 3 in. in length and rise in pairs from the stems below the leaves. Mr. Forbes also collected in Sumatra specimens (Herb. Forbes 2889) of a small tree with elliptic, caudate-acuminate leaves

cuneate at the base, which probably belong to a fourth species of *Pseudo-eugenia*. The flower-buds of this, which measure less than .1 in. in length, are borne in pairs below the leaves.

10. BARRINGTONIA, Forst.

Trees. *Leaves* alternate, crowded towards the ends of the branches, entire or slightly crenate-serrate, pinnate-nerved, not dotted. *Flowers* in elongated terminal and lateral racemes, or in interrupted spikes; bracts small, deciduous. *Calyx-tube* ovoid or turbinate, scarcely produced above the ovary; lobes 2-4, valvate, or 3-5, imbricate. *Petals* 4 rarely 5, much imbricate, somewhat adnate at the base to the staminal tube. *Stamens* numerous, in several series, connate into a short tube at the base; filaments filiform, long, all bearing anthers. *Ovary* inferior, 2-4-celled, crowned by an annular disc; style long, filiform, simple, stigma small; ovules 2-8 in each cell, pendulous. *Fruit* fibrous or somewhat berried, globose, ellipsoid or quadrangular, crowned by the calyx, by abortion 1-seeded. *Seed* ovoid or ellipsoid, without albumen; embryo large, exhibiting two layers, cotyledons nearly obsolete. **DISTRIB.**—Species 25; in tropical Asia, Africa, Australia and Polynesia, often near the sea.

Sect. I. BUTONICA. Calyx closed in bud and entire, ultimately splitting into 2 or sometimes into 3 lobes: flowers pedicelled.

Racemes short, erect or sub-erect; fruit conical.

Racemes terminal, erect; flowers 2.5 to 3 in. long and of greater diameter; fruit angled but not winged at the base 1. *B. speciosa*.

Racemes lateral or terminal, sub-erect; flowers less than 1 in. in diam.; fruit with 8 downward-pointing wings at the base 2. *B. conoidea*.

Racemes elongated, pendulous; fruit ovoid 3. *B. racemosa*.

Sect. II. STRAVIDIUM. Calyx with 4 (sometimes 3 or 5) imbricate lobes.

Racemes terminal, erect, short, 1- to 3-flowered 4. *B. pauciflora*.

Racemes lateral, pendulous, elongate, many-flowered.

Flowers more than .5 in. across; leaves with distinct petioles from .75 to 3 or 4 in. in length.

Flower-buds just before expansion about .25 in. long; fruit ovoid or elliptic, not angled or only slightly so; rachis much thickened in fruit 5. *B. macrostachya*.

Flower-buds just before expansion more than .25 in. long; fruit oblong, 4-angled.

Main-nerves of leaves 6 or 7 pairs; fruit 3 in. long; rachis of spike thickening slightly in fruit 6. *B. Scortechinii*.

Main-nerves of leaves 9 to 12 pairs; fruit glabrous, acutely 4-angled, less than .2 in. long; rachis of spike hardly thickening in fruit 7. *B. sumatrana*.

- Main-nerves of leaves 8 to 12 pairs; fruit minutely pubescent, 4 or 5 in. long; rachis of spike thickening much in fruit ... 8. *B. musiformis*.
 Flowers less than .5 in. across; leaves sessile or with very short petioles.
 Flowers pedicelled:—
 Fruit fusiform ... 9. *B. fusiformis*.
 Fruit, oblong truncate, boldly 4-angled ... 10. *B. acutangula*.
 Flowers sessile or nearly so; fruit sub-globose 11. *B. spicata*.

1. *BARRINGTONIA SPECIOSA*, Forst. Char. Gen. t. 38 and t. 38 A and B. A glabrous tree, 30 to 50 feet high; young branches stout, grey. Leaves thinly coriaceous, obovate-oblong or obovate, with broad rounded apex and much narrowed base, sessile, entire; main-nerves about 10 pairs, not prominent; length 6 to 14 in.; breadth 3.5 to 7 in. Panicles short (4 to 8 in. long) erect, terminal, with 1 or 2 leaf-like bracts at the base, few-flowered. Flowers 6 to 12, large (2.5 to 3 in. long and 5 in. in diam.), on long pedicels bracteolate at the base. Calyx with 2 large oblong, nerved (2 to 4 in.) lobes .75 to 1.25 in. long, persistent. Petals 4, white, larger than the calyx, (2.5 in. broad) deciduous. Stamens very numerous, longer than the petals but shorter than the style. Fruit large, shining, quadrangular-truncate at the base, tapering to the apex and crowned by the persistent calyx, bluntly 4-angled, sometimes sub-ovoid and less prominently angled, 3 in. or more in breadth at the base and slightly more in length; pericarp very thick, fibrous, spongy. Seeds ovoid, 2 or more in. long. Flor. des Serres IV, 409; Linn. f. Suppl. 312; DC. Prodr. III, 288; Roxb. Fl. Ind. II, 636; Wall. Cat. 3632, excl. B; Blume Bijdr. 1096; W. & A. Prodr. 333; Wight Ic. t. 547; Miq. Fl. Ind. Bat. I, Pt. 1, 485; Miers in Trans. Linn. Soc. Ser. II, Bot. 1, 55, t. 10; Kurz For. Fl. I, 496; Clarke in Hook. fil. Fl. Br. Ind. II, 507; Trimen Flora Ceylon II, 189. *B. asiatica*, Kurz in Journ. As. Soc. 1877, Pt. 2, 70. *B. ? macrophylla*, Miq. l.c. 491. *Mammea asiatica*, Linn. Sp. Pl. 731. *Agasta splendida*, *asiatica* and *indica*, Miers l.c. 60-64, tt. 11, 12. *Butonica*, Rumph Herb. Amb. III, t. 114.

In all the Provinces, on the sea-coasts: DISTRIB.—The shores of the Malay islands and British India; also of Australia and Polynesia.

The late Mr. Miers excluded from the genus *Barringtonia* everything except a plant now known by an imperfect specimen preserved in the Banksian collection and by Forster's drawings, which latter represent a 4-celled fruit. The plant here described to which Forster's name had, prior to the issue of Mr. Miers' monograph in the Linnæan Transactions, by common consent been given, is one of three forms of the plant on which Miers founded the genus *Agasta*. On characters largely based upon slight differences in the shape of the fruit, Miers distinguished his three species *Agasta splendida*, *asiatica* and *indica*. The latest writers on

Indian Botany who have dealt with the Indian *Barringtonias* (Mr. C. B. Clarke in Hooker's *Flora of British India*, and the late Dr. H. Trimen in his *Flora of Ceylon*) adopt the view that obtained prior to the publication of Miers' paper, and they believe that the three species of *Agasta* of the latter author are merely forms of the *Barringtonia speciosa* of Forster. If Miers' arrangement, however, is to be followed, the name of the plant occurring on the coasts of the Malay Peninsula and of British India would be either *Agasta indica* or *A. asiatica* according to the shape of the base of the fruit. Miers says of the fruit of the form which he considers alone entitled to the name *Barringtonia speciosa*, *fructus non vidi*, and he relies solely on Forster's figure (*Char. Gen.* t. 38 B, fig. b). In his account of it that figure no doubt shows a 4-celled fruit. Whether or not Forster or his artist had a fully-developed fruit before him when he made the drawing referred to cannot be known. But however that may be, the characters, other than the number of cells in the fruit of Forster's *Barringtonia* and of Miers' three *Agastas* are practically alike, and I fail to see any good basis for the foundation on them of four species belonging to two genera.

2. *BARRINGTONIA CONOIDEA*, Griff. Notul. 656. Ic. 635, 636, fig. 1. A large bush or small tree, glabrous; young branches sub-sulcate. *Leaves* thickly membranous, oblanceolate-elliptic or cuneate-oblong, narrowed at the minutely subcordate or rounded base to the short, stout petiole; the apex blunt or sub-acute; the edges obscurely crenate-serrulate or subentire; main-nerves 9 to 13 pairs, curved, ascending; length 4·5 to 10 in.; breadth 2 to 4 in.; petiole 1·5 to 2 in. *Racemes* suberect, lateral or terminal, few-flowered, about 4 in. long, glabrous or puberulous. *Flowers* less than 1 in. long and 1 in. across, on pedicels 5 to 6 in. long. *Calyx* with a subcylindric tube, 1·5 in. long; the base with 8 gibbous processes; the limb bipartite. *Petals* 4, fleshy, ovate-lanceolate. *Stamens* much exceeding the corolla. *Fruit* fibrous-fleshy, conoid, produced at the base into 8 wing-like semi-cordate fleshy processes and crowned at the apex by the calyx, 2·5 in. long and 1·75 in. broad at the base. Kurz For. Flor. Burma I, 497; Clarke in Hook. fil. Fl. Br. Ind. II, 508. *B. alata*, Wall. Cat. 3633. *Butonica alata*, Miers in Trans. Linn. Soc. Ser. II, Bot. I, 70, t. 14, figs. 10 to 15.

MALACCA: *Griffith* (Kew Dist. 2423). PERAK: *Scortechini* 1385. BURMAH: *Wallich*.

At once distinguished by its curious conical fruit winged at the base.

3. *BARRINGTONIA RACEMOSA*, Roxb. Hort. Beng. 52; Fl. Br. Ind. II, 634. A glabrous tree, often 50 feet high; young branches rather stout, cinereous. *Leaves* membranous, oblong-obovate or oblanceolate, shortly acuminate, narrowed to the shortly petiolate base, faintly crenate-denticulate; main-nerves 8 to 15 pairs, spreading or ascending, thin but prominent on the lower surface when dry; length 4 to 12 in.; breadth 2 to 4 in.; petiole 1 to 2·5 in. *Racemes* much longer than the leaves, (10 to 24 in. long) from the axils of fallen leaves or terminal,

pendulous, many-flowered, minutely bracteolate. *Flowers* distant, 1·5 to 2 in. in diam., on thin pedicels ·2 to ·3 in. long, buds globose. *Calyx* turbinate, obconic, 2- or 3-partite, permanent. *Petals* 4, oblong. *Stamens* very numerous, much longer than the calyx but shorter than the style. *Fruit* as large as a hen's egg and of much the same shape, but somewhat 4-sided, nearly smooth, the pericarp leathery; seed solitary ovate-oblong. DC. Prodr. III, 288; Wall. Cat. 3634; W. & A. Prodr. 333; Wight Ic. t. 152, including fruit; Bot. Mag. t. 3831; Dalz. & Gibs. Bomb. Fl. 94; Gaud. Voy. Freyc. t. 107; Vidal, F. Fl. Fil., t. 50a; Kurz For. Fl. I, 496; Clarke in Hook. fil. Fl. Br. Ind. II, 507; Trimen Flora Ceyl. II, 189. *B. speciosa*, Wall. Cat. 3632. *B. alba*, Miq. Fl. Ind. Bat. I, Pt. 1, 487. *Eugenia racemosa*, Linn. Sp. Pl. 673. *Stravidium album*, DC. Prodr. III, 289. *Butonica racemosa* and *alba*, Miers in Trans. Linn. Soc. Ser. II, Bot. I, 65, 66, t. 13, figs. 1-17. *B. rubra* and *incluta*, Miers l.c. 70, 71, t. 14, figs. 1-3, 19.—Rheede Hort. Mal. IV, t. 6.

In all the provinces; on the sea shores. **DISTRIB.**—Brit. India, Malayan Archipelago, Polynesia.

4. *BARRINGTONIA PAUCIFLORA*, King n. sp. A tree, 30 or 40 feet high; young branches slender, glabrous, pale-brown when dry. *Leaves* thickly membranous, broadly oblanceolate narrowed into the petiole at the base; the apex suddenly and shortly caudate-acuminate; main-nerves 8 to 10 pairs, curving upwards; length 3 to 4·5 in.; breadth 1·25 to 2 in.; petiole ·4 to ·8 in., slender. *Raceme* solitary, terminal, erect, 1·5 to 2 in. long, bearing only 2 or 3 flowers or sometimes only a single one. *Flowers* about 1·75 in. long. *Calyx-tube* funnel-shaped, boldly 4-angled, sparsely rufous-furfuraceous, ·4 in. long; the lobes 4, ovate-rotund, blunt, shorter than the tube. *Petals* 4, obovate-oblong, glabrous, 1 in. long. *Stamens* longer than the petals. *Fruit* unknown.

PERAK: *Scortechini* 939; *King's Collector* 6355.

5. *BARRINGTONIA MACROSTACHYA*, Kurz in Journ. As. Soc. Beng. XLVI, Pt. 2, 71; For. Flora Burma II, 498. A glabrous shrub or small tree; young branches pale-brown, striate. *Leaves* oblong-oblan-ceolate or oblong-elliptic, narrowed to the long slender petiole, the apex abruptly acuminate, the edges entire or with broad shallow crenations; main-nerves 14 to 18 pairs, curved, ascending, rather prominent beneath when dry; length 5 to 12 in.; breadth 2 to 5 in.; petiole 1 to 4·5 in. *Spikes* lateral (often extra-axillary) or terminal, pendulous, 1 to 2 feet long, glabrous or puberulous, stout, rather fleshy and much thickened in the fruiting stage; bracteoles minute, caducous. *Flowers* sessile, crowded, nearly 2 inches long and 1 in. across when expanded. *Calyx-tube* obconic, 4-angled, ·25 in. long; the limb with 4 broad, blunt lobes

·2 in. long. *Petals* oblong sub-acute, 1 in. long. *Filaments* twice as long as the petals. *Fruit* broadly-ovoid or elliptic, smooth, not angled or only slightly so, crowned by the small calyx-lobes, 1·5 to 2 in. long and about 1·35 in. in diam. Clarke in Hook. fil. Fl. Br. Ind. II, 509 (excl. syn. *B. pendula*, Kurz and *Doxomma pendula*, Miers). *B. cylindrostachya*, Griff. Notul. IV, 655. *B. sarcostachys*, Miq. Fl. Ind. Bat. I, Pt. 1, 490. *Stravidium sarcostachys*, Blume in Van Houtte Fl. des Serres, VII, 24. *S. acuminatum*, Wall. Cat. 3636. *Doxomma macrostachyum*, *cylindrostachyum*, *acuminatum*, Miers in Trans. Linn. Soc., Ser. II, Bot. I, 104, 100, 102. *Careya macrostachya*, Jack in Mal. Misc. I, 47; DC. Prodr. III, 295.

MALACCA: *Maingay* (K.D. 763); *Griffith* (K.D. 2421): PENANG: *Curtis* 1581. NEGRI SEMBILAN: *Ridley* 1852. PERAK: *Scortechini* (without No.); *Wray* 1299, 2410, 3136, 3642, 3635; *King's Collector* 3402, 3779, 4136, 10075, 10206, 10615. DISTRIB.—Borneo, Burmah, *Griffith*; *Gallatty*.

This is allied to *B. pendula*, Kurz—a rare species from Southern Burma originally described by Griffith as *Careya pendula* (Notulæ IV, 661). That species, however, has narrower leaves than this with fewer nerves; the calyx-tube is elongate, the stamens are only about one inch long; and the fruit is narrowly oblong, boldly 4-angled, more than 2 in. long and only about ·65 in. in diam. There is an excellent drawing of this plant with full analyses of the flowers in the Herb. Kew, which was made from living specimens by the Rev. C. Parish. The species has been reduced in Hooker's Flora of British India to *B. macrostachya* from which it differs in the points above noted.

6. BARRINGTONIA SCORTECHINII, King n. sp. A glabrous tree, 50 to 60 feet high; young branches slender, pale-brown, glabrous. *Leaves* thinly coriaceous, elliptic-oblong to oblanceolate-oblong, tapering (often very much) to the petiole; the apex acute or shortly acuminate; the margins entire or obscurely and minutely dentate; main-nerves 6 or 7 pairs, spreading, curved; length 3 to 6·5 in.; breadth 1·5 to 2·5 in.; petiole ·5 to ·8 in. *Spikes* lateral, pendulous, 6 to 18 in. long, glabrous, rather slender but slightly thickening with age. *Flowers* numerous, 1·5 to 2 in. long, narrow. *Calyx-tube* bracteate at the base, glabrous, obconic, 4-angled, ·25 in. long; the 4 lobes shorter than the tube, broad, rounded. *Petals* oblong, blunt, ·75 in. long. *Filaments* 1·5 to 2 in. long. *Ovary* 3-celled (usually). *Fruit* oblong, somewhat tapered but truncate at each end: the apex mamillate crowned by the small calyx-lobes, smooth, 3 in. long and 1 in. diam.

PERAK: *Scortechini* 237, 395, 1674, 2020; *Wray* 2087; *King's Collector* 3598, 3854, 6252; *Curtis* 1296.

There are two distinct forms under this species; one with oblong-elliptic

leaves and rather larger flowers; the other with leaves oblanceolate, more slender spike-rachis and smaller flowers, but the two pass into each other.

7. *BARRINGTONIA SUMATRANA*, Miq. Fl. Ind. Bat. Suppl. 315. A glabrous tree; young branches pale, as thick as a goose-quill. *Leaves* coriaceous, elliptic or oblong-elliptic tapering much to the base, the apex shortly and rather abruptly acuminate, the edges obscurely serrate or entire, slightly wavy somewhat recurved when dry; upper surface shining when dry, the lower dull and paler, both minutely reticulate; main-nerves 9 to 12 pairs, thin but prominent; length 4·5 to 7·5 in.; breadth 1·4 to 3 in.; petiole ·75 to 2 in., thickened at the base. *Spikes* axillary and terminal, pendulous, angled, glabrous, 9 to 15 in. long, not thickening in fruit. *Flowers* numerous, more than 1 in. long and nearly as much across, sessile. *Calyx* ·5 in. long; the tube infundibuliform, acutely 4-angled; the lobes half as long as the tube, broadly ovate, concave, spreading. *Petals* broadly oblong, very blunt, ·65 in. long. *Stamens* ·75 in. long or more. *Style* slender, 1·6 in. long. *Fruit* oblong, somewhat tapered to the base, less so to the calyx-crowned apex, acutely 4-angled, smooth and shining, 1·75 in. long, and ·65 in. in diam.

SINGAPORE: *Ridley* 277, 2056. SUMATRA: *Miquel* (Herb. Bogor 4536). CELEBES: *Beccari*.

8. *BARRINGTONIA MUSIFORMIS*, King n. sp. A large tree, 60 to 80 feet high; young branches as thick as the fore finger, brownish, glabrous. *Leaves* thinly coriaceous, entire, or obscurely crenate towards the apex, oblong-oblanceolate or narrowly elliptic-oblong, much tapered to the long slender petiole, the apex shortly acuminate; main-nerves 8 to 12 pairs, curved, ascending, not conspicuous; length 5 to 10 in.; breadth 1·75 to 3·25 in.; petiole ·75 to 2·25 in. thickened at the base. *Spikes* axillary, suberect, 12 to 14 in. long, stout, striate, thickening to ·6 in. in diameter or more in fruit, the cicatrices of the fallen flowers very prominent, scurfy-puberulous. *Flowers* large, sessile. *Calyx* campanulate, 1·25 in. in diam. at the mouth, densely but minutely rusty-pubescent; the tube subcylindric, only ·2 in. long; the 4 lobes large, ovate-rotund, blunt, ·75 in. long. *Petals* 4, concave, rotund, scurfy outside. *Fruit* narrowly-oblong, 4-angled, sub-truncate at each end, the upper crowned by the calyx and the 2 inch long style, minutely pubescent, 4 or 5 in. long, and 1 to 1·5 in. thick.

PERAK: *King's Collector* 5746, 6154.

I have seen no expanded flowers of this as the collected specimens are either in bud or in fruit. Its nearest allies are *B. augusta*, Kurz, *B. pterocarpa*, Kurz, and *Doxomma magnificum* Miers, but all these have much smaller flowers and their leaf petioles are very short. The ripe fruit of this resembles in shape a small banana, but the endocarp and pericarp have a very different texture, being in this densely fibrous.

9. *BARRINGTONIA FUSIFORMIS*, King n. sp. A small tree, 10 to 20 feet high; young branches slender, puberulous, pale when dry. *Leaves* membranous, oblanceolate or obovate-oblong, narrowed to the cordate base, sessile or sub-sessile; the apex obtuse or acute; the edges remotely serrate becoming almost entire when old; main-nerves 12 to 16 pairs, curved, ascending, slightly prominent on the lower surface when dry; length 4 to 8 in.; breadth 1·4 to 2·4 in.; petiole (if present) only ·05 in. long. *Racemes* axillary, very slender, pendulous, much exceeding the leaves, lax, minutely rusty-pubescent, 1 to 2 feet long, surrounded at the base by a whorl of lanceolate persistent bracts ·5 in. long. *Flowers* ·4 in. across, distant, on slender pedicels 1 in. long; the bracteole at the base of each pedicel lanceolate, deciduous. *Calyx* 3 in. long; the tube obconic, densely rusty-puberulous; the teeth 4, broad, rounded, less puberulous than the tube. *Petals* slightly longer than the calyx, broadly obovate. *Stamens* three times as long as the petals. *Fruit* fusiform, tapering almost equally to each end; the apex crowned by the small calyx, 4-angled, deciduously rusty-pubescent, 2·25 in. long and only ·5 in. in diam.

PERAK: *Scortechini*; *King's Collector* 10388, 10643, 10094.

The very long flower pedicels and the narrowly fusiform fruit distinguish this from all the other species.

10. *BARRINGTONIA ACUTANGULA*, Gærtn. *Fruct.* II, 97, t. 101. A glabrous tree, 25 to 50 feet high; young branches thin, pale-grey, glabrous. *Leaves* obovate-oblong, or cuneate-elliptic, much narrowed to the shortly petiolate base, the apex broad rounded or subacute, the edges minutely denticulate or cuneate: main-nerves 10 to 13 pairs, spreading, not prominent; length 2 to 5 in.; breadth 1·1 to 2 in.; petiole ·15 to ·2 in. *Racemes* much exceeding the leaves, slender, pendulous, many-flowered, from 6 to 15 in. long. *Flowers* ·3 or ·4 in. across, in slender pedicels from ·05 to ·25 in. long. *Calyx* with short tube and 4 rounded, regular, ciliate teeth. *Petals* small, under ·25 in. long. *Filaments* about three times as long. *Fruit* oblong or oblong-ovoid, truncate at both ends, crowned by the small calyx, glabrous, boldly but bluntly quadrangular, 1·25 to 1·5 in. long. Roxb. *Fl. Ind.* II. 635; Blume *Bijdr.* 1097; W. & A. *Prodr.* 333; Miq. *Fl. Ind. Bat.* I, Pt. 1, 488; Dalz. & Gibs. *Bomb. Fl.* 95; Bedd. *Fl. Sylv.* t. 204; Brand. *For. Fl.* 235; Kurz *For. Fl. Burm.* I, 497; Clarke in Hook. *fil. Fl. Br. Ind.* II, 508; Trimen *Flora Ceylon* II, 191. *Stravidium rubrum*, DC. *l.c.* 289. *S. acutangulum*, Miers in *Trans. Linn. Soc. Ser. II, Bot. I*, 80 t. 17 figs. 1 to 14. *S. obtusangulum* and *S. Rheedii*, Blume in Van Houtte *Flore des Serres* VII, 24; Miers *l.c.* *Eugenia acutangula*, Linn. *Sp. Pl.* 673.

I include this species as Malayan with some hesitation. Most of the Malayan

specimens bearing the name I would refer to *B. spicata*, Bl. It is however a widely distributed and common tree in India and particularly so in Burma and it is quite likely to occur in Quedah and the northern part of Perak.

11. *BARRINGTONIA SPICATA*, Blume Bijdr. 1097. A tree, 30 or 40 feet high; young branches slender, smooth, brown when dry. *Leaves* oblong-ob lanceolate, tapering to the short petiole, the apex acute or subacute, the edges distinctly serrate-dentate; main-nerves 8 to 10 pairs, curving slightly, ascending; length 4 to 8 in.; breadth 1.4 to 2.4 in.; petiole .2 to .3 in. *Spikes* axillary or terminal, exceeding the leaves, very slender, pendulous; bracteoles minute, caducous. *Flowers* small, numerous but not crowded, sessile or with a very short pedicel, about .5 in. in diameter when expanded. *Calyx* with obconic, rusty-pubescent tube less than .1 in. long, and 4 broad, rounded teeth half as long. *Stamens* .5 in. long. *Fruit* sub-globose, glabrous, crowned by the enlarged calyx-lobes, about .6 in. in diam. Miq. Fl. Ind. Bat. I, Pt. 1, 489; Vriese Ned. Kruidk. Arch. III, 41. *Stravidium spicatum*, DC. Prodr. III, 289; Blume in Van Houtte Flore des Serres VII, 24. *S. spicatum* and *globosum*, Miers in Trans. Linn. Soc. Ser. II, Bot. 1, 85. *Gustavia globosa*, Span. Trans. Linn. Soc. XV, 204. ? *Stravidium denussum*, *pubescens*, *reticulatum*, *Horsfieldii* and *serratum*, Miers l.c. 81 to 86. ? *S. coccineum*, DC. Prodr. III, 289; Miers l.c.

MALACCA: Griffith (K.D.) 2425; Derry 1221; Maingay (K.D.) 765. PENANG: Curtis 397. TRANG: King's Collector 1404. PERAK: King's Collector 4681. PROVINCE WELLESLEY: Ridley 7043. DISTRIB.—Jaya, Borneo; Motley 537, 582; Zollinger Cat. 534.

This resembles *B. acutangula*, Gaertn., but differs in having sessile flowers, shorter stamens, and sub-globose not elongated angular fruit. The leaves also are less obovate. It is a widely distributed species and therefore presents various forms, many of which have been treated as species.

11. *PLANCHONIA*, Blume.

Trees with alternate, membranous, crenulate, pinnately-nerved leaves without dots, crowded towards the ends of the branches. *Flowers* white or yellowish-green, in short terminal racemes. *Calyx-tube* turbinate, little produced beyond the ovary; its mouth with 4 imbricate lobes. *Petals* 4, imbricate. *Stamens* very numerous, in several series, slightly united at the base into a ring, the inner without anthers, the filaments of all long and slender. *Ovary* inferior, 3-4-celled, crowned by an annular disc. *Style* 1, long, slender, crowned by the small stigma; ovules many in each cell. *Fruit* large, fibrous, ovoid, crowned by the persistent calyx-lobes, 1-3-celled. *Seeds* several, ellipsoid, the testa coriaceous, albumen absent, cotyledons short. DISTRIB.—Three species; littoral, from the Andaman islands to Australia.

- Leaves obovate, distinctly crenulate; flowers sessile ... 1. *P. sundiaca*.
 Leaves broadly elliptic, obscurely crenulate; flowers on
 long pedicels ... 2. *P. andamanica*.

1. *PLANCHONIA SUNDIACA*, Miq. A tree, 50 feet high; young branches thicker than a goose-quill, the bark rough, pale-brown. *Leaves* distinctly crenulate, obovate, much and gradually narrowed into the petiole; the apex with a short triangular apiculus; both surfaces brown (when dry), the reticulations faint: main-nerves 12 to 18 pairs, spreading, depressed on the upper prominent and often pale in colour on the lower surface; length 3 to 6·5 in.; breadth 1·75 to 3 in.; petiole ·3 to ·6 in. *Racemes* 2 in. long, few-flowered. *Flowers* white with pink towards the centre, about 1·5 in. long, sessile. *Calyx-tube* ·6 or ·7 in. long, campanulate, ribbed below: the lobes oblong, broad, subacute. *Petals* narrowly oblong, acute, longer than the calyx and about as long as the stamens. *Fruit* (unripe) broadly oblong-ovoid.

PERAK: *Wray* 2366; *King's Collector* 7096. *DISTRIE*.—Sumatra, *Forbes* 3254.

2. *PLANCHONIA ANDAMANICA*, King n. sp. A tree; young branches as thick as a goose-quill, pale-brown, smooth. *Leaves* broadly elliptic or elliptic-rotund, slightly and abruptly tapered into the narrowly winged petiole, the apex with a short triangular acumen, the edges indistinctly crenulate; upper surface olivaceous-brown, the lower pale-brown, not olivaceous; main-nerves 10 to 12 pairs, spreading, dark on the upper and pale on the lower surface but not very bold on either, length 5 to 7 in.; breadth 3 to 4 in.; petioles ·6 to ·8 in. *Racemes* 3 or 4 in. long; the flowers about 2 in. long on stalks 1 to 2 in. long. *Calyx* ·8 or ·9 in. long, campanulate, its lobes large, elliptic-rotund, obtuse. *Petals* broadly elliptic, very obtuse. *Fruit* unknown.

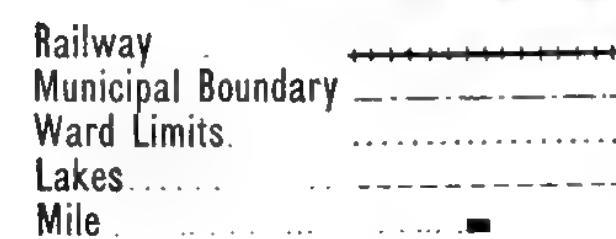
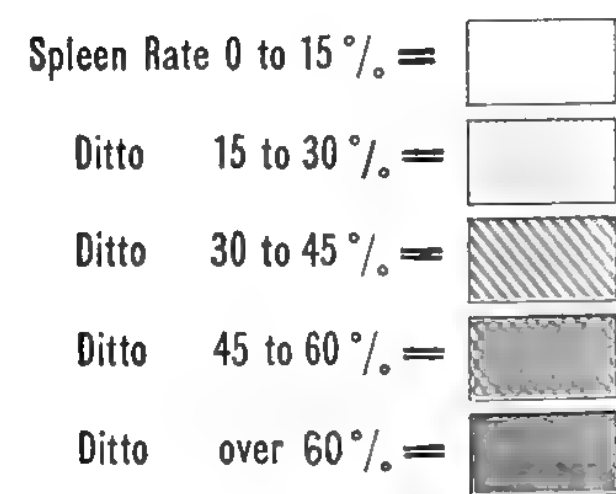
ANDAMAN ISLANDS: *King's Collector*.

MAP.
ILLUSTRATING THE
SPLEEN RATE OF THE MUNICIPALITIES
ON THE
EAST BANK OF HOOGLY TO THE NORTH
OF CALCUTTA.

Scale 1 Inch = 1 Mile.



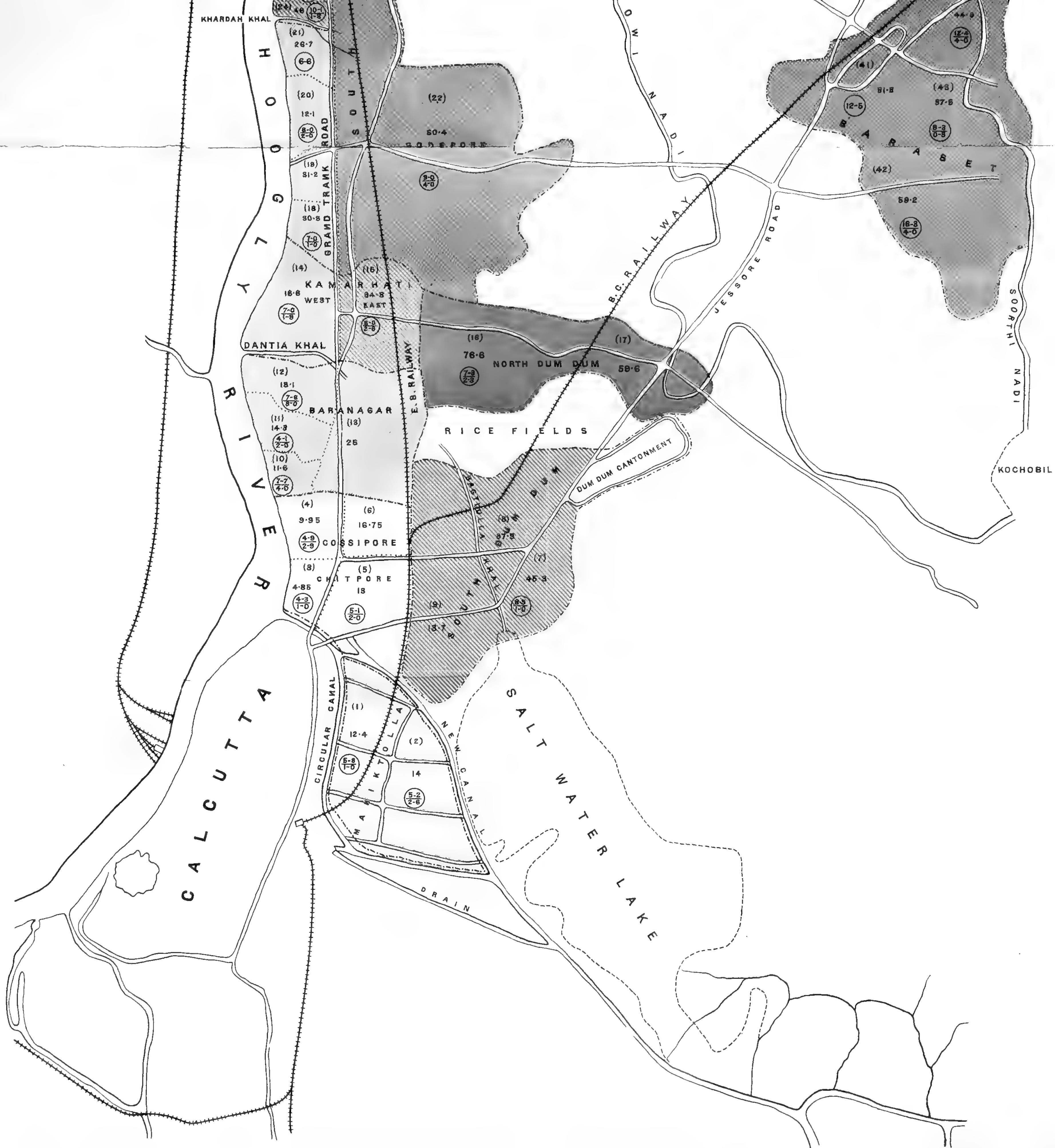
REFERENCES.



- (1) Maniktolla West.
- (2) Ditto East.
- (3) Chitpore West.
- (4) Cossipore West.
- (5) Chitpore East.
- (6) Cossipore East.
- (7) South Dum-Dum, Ward I.
- (8) " " " II.
- (9) " " " III.
- (10) Barranagar, Ward I.
- (11) " " " II.
- (12) " " " III.
- (13) " " " IV.
- (14) Kamarhati West.
- (15) " East.
- (16) North Dum-Dum West.
- (17) " " East.
- (18) Agorpara.
- (19) Panihatti.
- (20) Sukchar.
- (21) Khardah.
- (22) Sodepore.
- (23) Nona.
- (24) Tittaghar, Ward IV.
- (25) " " " III.
- (26) " " " II.
- (27) " " " I.
- (28) Monirampore.
- (29) Nawabgung.
- (30) Jehapore.
- (31) Gurulia North.
- (32) " South.
- (33) Bhatparah, Ward III.
- (34) " " " II.
- (35) " " " I.
- (36) Naihati, Ward I.
- (37) " " " II.
- (38) " " " III.
- (39) " " " IV.
- (40) " " " V.
- (41) Baraset, Wards I & II.
- (42) " " " III.
- (43) " " " IV.
- (44) " " " V.



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V.
- HOOGHLY RIVER
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BARRACKPORE CANTONMENT
GARULIA
TITTAGHAR
KHARDAH
SOUTH BARRACKPORE
NONA
SODHORE
RAILWAY
ROAD
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(35) 10.5
(34) 17
(33) 23.6
(32) 21.1
(31) 95.9
(30) 24
(29) 48.0
(28) 24
(27) 24
(26) 24
(25) 30
(24) 48
(23) 51.6
(22) 60.4
(21) 26.7
(20) 12.1
(19) 31.2
(18) 30.8
(17) 9.8
(16) 4.4
(15) 10.8
(14) 10.8
(13) 18.8
(12) 7.0
(11) 4.4
(10) 10.8
(9) 4.4
(8) 10.8
(7) 4.4
(6) 10.8
(5) 4.4
(4) 10.8
(3) 4.4
(2) 10.8
(1) 4.4
(44) 44.0
(43) 57.5
(42) 59.2
(41) 12.5
(40) 8.2
(39) 51.8
(38) 18.8
(37) 4.4
(36) 10.8
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JOURNAL

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VI.—*Wolf Hybrids in Gilgit*.—By MAJOR J. MANNERS-SMITH, V.C., C.I.E.

[Read 7th August, 1901.]

During the last few years, since about 1897 a species of wild dog, bred as it would seem from a true wolf and a domestic village dog has existed round the village of Minawar some 9 miles from Gilgit.

The first specimen which I saw was by moonlight at Jutial some 3 miles from Gilgit in December, 1898, or in January, 1899. At the time I mistook the beast for a wild dog (*Cyon*), it being evident from its general appearance that it was not a wolf; and I had not then heard of the hybrids.

The animal was exactly like the specimen the skin and skull of which was sent to the Indian Museum in May, 1901, and like a live bitch which is still in my possession and the photograph of which is attached.

The next specimen I saw was my bitch "Jungly." She was brought in as a puppy in May, 1899. In appearance she was sooty coloured with ears that drooped forward. The villagers who brought her declared that she was a wolf and that they had seen the mother distinctly. The other puppies with her some 4 or 5 in number had, they said, escaped. I unfortunately did not institute any enquiries at the time, still thinking that the puppy was that of a wild dog and that the villagers did not know or recognise the difference between wolves and wild dogs.

Later on however when my bitch grew up examination proved by dentition, number of mammae and other characteristics such as the lack of any marked brush in tail, and her abnormal weight for a true wild dog that she belonged to the genus *Canis* and not to *Cyon*. It thus became evident that she must be a 'hybrid' and I began to make enquiries at Minawar to try and verify facts.

Unfortunately no very certain or absolutely reliable evidence of the animal's pedigree has been obtained. It was a well known fact however as I learnt then and from subsequent enquiries that a female wild animal—the villagers declare it to be a bitch wolf—has for 3 years past in successive winters, *i.e.*, in 1898-99, 1899-1900, and now again in 1900-1901 when in season hung about the village precincts and has attracted the attentions of their village dogs. These have followed her some way from the village and from them she has been pleased to select a mate to satisfy her natural desires. This phenomenon has been seen and is vouched for by several reliable eye witnesses. For three years now the results of this strange union have been proved by the capture of the young cubs.

First in 1899, when my bitch was caught and brought in to me in May. The pups then were fairly big and several escaped, one only being caught.

Then in 1900, on this occasion all the pups some 8 or 9 in number were caught, but were killed by the goat herd boys who found them when quite small. As I happened to be away from Gilgit no report was made to me at the time and no specimens of the puppies were kept to show.

Finally this year in 1901. First the pups were caught and brought in to Gilgit and a few days after the mother. As she was injured by the trap and appeared to be dying I had her killed as well as 2 of her pups and sent the skins and skulls to the Indian Museum.

One or two of the pups are still alive in Gilgit. They are almost entirely like the village dog sire and show little sign of the wolf strain or of the characteristics of the mother except that they are shy and more furtive in their movements than ordinary puppies. Apart however from the evidence of the men who brought in the pups I am satisfied from their wild behaviour when brought to me and which they had not abandoned entirely several weeks after capture when last I saw them that they were really the offspring of the wild bitch. I put the pups to the mother when she was brought in to Gilgit and she allowed them to try and suckle her and though injured did nothing to harm them and appeared pleased to have them near her.

According to the villagers' statement the litter of last year which

was killed off was exactly like that of this year, *i.e.*, the puppies all took after the domestic dog sire and not the wild mother.

On the other hand the litter of 1899 included my bitch "Jungly" and, according to the villagers, several other puppies like her which escaped. All of these had fur of the wild wolf colour and in appearance were nearer to the wolf than to the domestic dog.

One of them is probably the mother of this year's puppies, *viz.*, the specimen which is now in the Indian Museum, and at least one other exactly like her in shape though with very light coloured almost white fore-legs was seen by me twice during the winter of 1900-1901 when out shooting between Gilgit and Minawar. These two animals have been known to kill village sheep and goats and have also been seen stalking herds of wild Oorial (*O. vignii*).

The hills round Minawar are infested with real wolves, more being caught and killed there each year than anywhere else in the district. My theory as to the origin of these animals is the following. That in the first instance, possibly in the winter of 1897-98 a dog wolf lured away a domestic dog bitch from the village of Minawar, or possibly that an old wolf bitch discarded by her own kind or injured in some way accepted the services of a Minawar village dog.

There would seem to have been a litter in 1898, if the animal I saw in the winter of 1898-99 was really one of these hybrids.

Since then at any rate it is certain that at least 3 litters of hybrids have been produced, and it seems probable that the last two, *i.e.*, those born in 1900 and in 1901, were a second cross from the true wolf. As one or more of the puppies of the 1899 litter some of which escaped when my 'Jungly' was caught, would seem to have followed the bad example of their mother and to have consorted with the Minawar village dogs. This may account for their offspring being so much more like the true dog than they themselves.

An attempt made to breed from my "Jungly" unfortunately failed. She was served by a half bred retriever spaniel in December, 1900. About the usual period for canine gestation she gave signs of being in pup. Her milk glands filled and she became unusually quiet and gentle and displayed great affection for the pups of another dog bitch which had been born shortly before. Usually she cannot be trusted unmuzzled with strange dogs or puppies. Nothing however resulted from herself.

"Jungly's" character is interesting and perhaps worth a short description. Though she has been brought up with domestic dogs from the time she was a month or so old her wild instincts are by no means subdued. She will still hunt anything she can unless carefully watched

and rated. She is inclined to bully small dogs, even those she knows well, especially of the weaker sex.

Her intelligence is considerable and though still shy of men and of strangers she shows affection for me and follows me well both on foot and when riding.

As an instance of her retentive memory the following anecdote may be of interest. When she was quite a small puppy a rather short tempered fox-terrier was sent me to take care of during the summer. This dog attacked her on one occasion and bit off the tip of her ear. Several months later when she had grown to nearly full size the dog and his owner were walking round the Kennels, when the latter asked me to let 'Jungly' loose. Without thinking I did so and she at once savaged the little dog, which she undoubtedly remembered, and was with difficulty prevented from killing him. Since then she has always been suspicious of white dogs, and is generally inclined to attack dogs of that colour, though usually indifferent to others unless excited or aggrieved herself.

From regular feeding and the care taken of her 'Jungly' has grown a good deal heavier than the "wild specimen" killed this year in Gilgit and sent to the Museum. Her coat also is not quite so dark, but in all other respects she appeared to me identical when they were compared. Her weight and measurements are as follows:—

Dimensions. Head and body 43 inches, tail without hair $13\frac{1}{4}$, with hair $14\frac{3}{4}$; Tarsus and hind foot, anterior aspect=7 inches, posterior aspect=9 inches; Height at shoulder 24 inches; round skull and jaws in front of ears over hair 18 inches. Weight=about 60 lbs.

VII.—*New species of Indian Hymenoptera.*—By MAJOR C. G. NURSE.

[Read 6th November, 1901.]

I venture to send descriptions of some new species of *Apidae*, which neither Mr. P. Cameron nor I have been able to identify with any described species. These are a portion of my collection of *Hymenoptera* made during the past three or four years, some of which have already been described by Colonel Bingham and Mr. Cameron, and the latter is still engaged in working out the remainder. I obtained altogether some 450 species, counting only the families dealt with by Colonel Bingham in his *Hymenoptera*, Vol. I of the Fauna of British India Series, and of these nearly a fourth appear to be hitherto undescribed.

1. *HALICTUS KRISHNA*, n. sp.

♂. Head and thorax closely and finely punctured, basal segment of

abdomen impunctate, remaining segments with minute shallow punctures; cordate space at the base of median segment reticulate in the centre, the sides with oblique divergent striæ; margins of abdominal segments in most specimens somewhat constricted. Dark bronze-green, basal half of antennæ black, becoming reddish-brown at apex; pubescence greyish-white; wings hyaline, with a slight fulvous tint, nervures and tegulæ testaceous.

♂. Similar; apex of clypeus pale testaceous.

Hab. Simla; Kashmir.

Length 5-7 mm.; Exp. 9-11 mm.

2. *HALICTUS CLARUS*, n. sp.

♀. Head and thorax very minutely and closely punctured, the punctures apparent only under a strong glass, clypeus with a few coarse punctures; enclosed space at the base of median segment finely reticulate, the segment concavo-truncate at apex; abdomen impunctate, the segments slightly constricted. Black and shining, where not hidden by pubescence; flagellum of antennæ more or less red, the apices of the abdominal segments testaceous, tibiæ and tarsi of the anterior legs, and femora, tibiæ and tarsi of the median and posterior legs, honey-yellow; pubescence greyish-white, short, but especially dense on the head, scutellum, and basal margins of the abdominal segments; wings clear Hyaline, nervures and tegulæ pale testaceous.

Hab. Deesa.

Length 6mm.; Exp. 12mm.

3. *HALICTUS FULGENS*, n. sp.

♀. Head finely and closely, thorax more sparsely, punctured, abdomen almost impunctate; cordate space at base of median segment finely reticulate, very convex, its apex forming a distinct ridge; clypeus much produced, transverse at apex. Jet black and shining, very thinly covered with greyish pubescence, which becomes more dense on the legs. In some specimens the apices of the abdominal segments are testaceous; wings hyaline, nervures and tegulæ testaceous.

♂. Similar, the base of first abdominal segment constricted, pubescence on the legs testaceous.

Hab. Simla.

Length 6-7mm.; Exp. 14mm.

This species resembles *H. nireus*, Biingham, (Jour. B., Nat. Hist. Soc. Vol. XII p. 124) but is a smaller and slighter insect, the clypeus is more produced, and thorax is sparsely and not closely punctured. I have a long series of each species, and they are readily separable.

4. *HALICTUS TESTACEUS*, n. sp.

♀. Head and thorax finely and closely punctured, abdomen with shallower punctures, cordate space at base of median segment reticulate. Head and thorax black, antennæ reddish-brown, legs and abdomen testaceous, becoming paler on the apical margins of the abdominal segments and on the tarsi; pubescence greyish and somewhat sparse; wings hyaline, nervures and tegulæ testaceous.

Hab. Simla.

Length 4.5 mm.; Exp. 10 mm.

5. *NOMIA SHIVA*, n. sp.

♀. Head somewhat coarsely punctured, the punctures running into striæ on the sides of the clypeus; thorax more closely and finely punctured, abdomen almost impunctate; enclosed space at base of median segment longitudinally striate; three longitudinally impressed lines on mesonotum, the outer two very faint. Black, the pubescence greyish-white, dense on the clypeus and front as far as the base of the antennæ, on the pronotum, postscutellum, legs, and apical margins of abdominal segments, on the latter forming broad bands. The apical margins of the abdominal segments when denuded of pubescence are pale, almost testaceous; wings hyaline, apical margins faintly fuscous; nervures and tegulæ testaceous.

Hab. Deesa; Ferozepur.

Length 8.9 mm.; Exp. 15-16 mm.

6. *NOMIA HIMALAYANA*, n. sp.

♀. Head closely and somewhat coarsely punctured, the punctures on the apex of the clypeus running into striæ; mesonotum and abdomen finely and closely, median segment more sparsely punctured; space at the base of median segment longitudinally striate; head with an impressed line from near base of antennæ to anterior ocellus. Black, the pubescence rich fulvous, and very dense on the mesonotum, scutellum, and postscutellum, pale fulvous and less dense on the head, legs, and margins of the abdominal segments; wings hyaline, nervures and tegulæ testaceous.

♂. Similar, the pubescence thinner, and, except on the thorax, almost cinereous. Posterior femora and tibiæ comparatively small.

Hab. Simla.

Length 7.8 mm.; Exp. 18 mm.

7. *NOMADA FLAVOZONATA*, n. sp.

♀. Head and thorax closely punctured, having a granular appearance, abdomen shining and more finely punctured; enclosed

space at the base of median segment rugose in the centre, the sides with divergent striæ, which become very fine apically; head above base of antennæ concave; three longitudinally impressed lines on mesonotum, the outer two very faint; scutellum large and prominent. Red; the apex of the mandibles, a spot near the base of the antennæ, another round the ocelli, the enclosed space at the base, the sides below, of the median segment, and narrow apical bands on the first three abdominal segments, black; median transverse bands, narrowed in the centre, on abdominal segments 2—4, yellowish; the head sparsely, and the sides of the median segment more densely pubescent, the pubescence with a golden tinge; wings subhyaline and iridescent, their apices slightly infuscated, tegulæ red, nervures reddish-brown.

♂. Black; the clypeus, labrum, basal portion of the mandibles, front below the bases of the antennæ (except two narrow outwardly diverging lines from the base of antennæ to the sides of the clypeus) the tegulæ, scutellum, postscutellum, and broad medial bands on the abdominal segments yellow; legs yellow, except the inner portions of the intermediate and posterior femora, which are ferrugineous, and a black macula on the inside of the posterior tibiæ; scape of antennæ yellow below, black above, flagellum ferrugineous red, with a black spot on joints 2—5; clypeus and front, scape of antennæ, median segment, thorax below, and base of first abdominal segment, with white pubescence; wings slightly more hyaline than in the ♀.

Hab. Ferozepur.

Length ♀ 10 mm., ♂ 12 mm.; Exp. ♀ 18 mm., ♂ 21 mm.

8. *NOMADA LUCILLA*, n. sp.

♂. Head and thorax closely but not very finely punctured, enclosed space at base of median segment reticulate, abdomen impunctate, shining. Black; the labrum, mandibles except at apex, the apex of the clypeus and of the front on each side, and two irregular spots on each of the abdominal segments yellow, the spots on the second and sixth segments largest; flagellum of the antennæ reddish-brown; apices of the femora and the whole of the tibiæ of the intermediate and posterior legs ferrugineous; abdomen mottled with ferrugineous, giving it a bronzy appearance; clypeus and front with golden pubescence, thorax below and sides of median segment with somewhat sparse whitish pubescence; wings subhyaline, somewhat darker towards the apex of the forewing; a clear hyaline patch across fourth cubital and third discoidal cells; tegulæ ferrugineous-red, nervures black.

Hab. Simla.

Length 8 mm.; Exp. 15 mm.

9. *NOMADA PRISCILLA*, n. sp.

♀ ♂. Head and thorax closely but not very finely punctured, median segment and abdomen impunctate; postscutellum very prominent; an impressed line on the median segment, enclosed space at the base of the segment raised, sharply defined, convex, a few outwardly divergent striæ at base, slightly rugose. Red; the abdomen black and shining; two yellow spots on second, fifth and sixth segments; some specimens have a similar spot on the fourth segment, and in others the spots, except on the second segment, are obsolete; pubescence white, very sparse, longest on median segment; wings hyaline, apex infuscated, tegulæ red, nervures reddish-brown.

Hab. Deesa; Matheran.

Length 5 mm.; Exp. 10 mm.

10. *MEGACHILE CÆLIOXYSIDES*, Bingham.

This species was described by Bingham in the Journal of the Bombay Natural History Society, Vol. XII, Part I, from my specimens he described the ♀, as I had not then a ♂. The following is a description of the latter.

♂. Similar to the ♀, but more slender, the abdomen cylindrical, not tapering towards the apex; the margins of the segments strongly constricted, apical segment with several teeth; the anterior tarsi normal, not dilated.

11. *MEGACHILE VERA*, n. sp.

♀. Closely resembles *M. cælioxyssides*, Bingham, but is a somewhat robuster insect; it differs only in having the trochanters and femora of the intermediate and posterior legs blood-red, and the femora of the anterior legs dark-red.

♂. Resembles *M. cælioxyssides* of the same sex, except that the apices of the tibiæ and the whole of the tarsi of the anterior legs are pale testaceous, the first joint of the tarsi being somewhat dilated; the intermediate legs have the trochanters, femora, and the apex of the tibiæ, and the posterior legs the trochanters and femora light red; the pubescence, especially on the clypeus and front, has a golden tint.

Hab. Deesa; Matheran.

Length 7.9 mm.; Exp. 13-15 mm.

12. *MEGACHILE KATINKA*, n. sp.

♀. Closely resembles *M. cælioxyssides*, Bingham, but the pollen brush is light red, and not white.

♂. Resembles the same sex of *M. cælioxyssides*, except that the

apex of the abdomen is notched but not dentate; the pubescence has a yellowish tint, especially on the clypens and front.

Hab. Matheran.

Length 8-9 mm., Exp. 16-18 mm.

Although the above three species bear considerable superficial resemblance to one another as regards size and puncturing, the characters I have given render them readily separable. I have a long series of each of them, and these characters are constant in each species.

13. *MEGACHILE PATELLA*, n. sp.

♀. Head thorax and abdomen finely and closely punctured, having a granular appearance; clypeus broader than long, transverse anteriorly; an inwardly-curved tooth at each angle of the scutellum, basal segment of the abdomen very slightly constricted. Black; the pubescence white and very sparse, forming narrow bands on apical margins of abdominal segments 1-5, yellowish-red on the inside of the posterior tarsi; pollen-brush golden; wings hyaline, nervures and tegulæ black.

♂. Similar, but smaller.

Hab. Simla.

Length 6-7 mm.; Exp. 12-14 mm.

14. *MEGACHILE ULRICA*, n. sp.

♀. Head, thorax and abdomen closely punctured, having a granular appearance; apical margins of abdominal segments 2-5 depressed, the depressed portion with pubescent bands. Black, the legs variegated below with dark red; pubescence very sparse, pure white on the head and thorax, abdominal bands greyish-white; on the tarsi the pubescence is testaceous, and on the inside of the posterior tarsi golden-red; wings hyaline, tegulæ light red, nervures black.

Hab. Matheran.

Length 8 mm.; Exp. 14 mm.

15. *ANTHIDIUM SALTATOR*, n. sp.

♀. Head, thorax, and abdomen closely and finely punctured; head slightly broader than thorax, clypeus quadrilateral, its anterior margin transverse; abdomen nearly as broad as long. Pale yellow; the flagellum of the antennæ, tips of the tarsi, base of the scutellum, and broad bands on the apical margins of abdominal segments, light red: the tips of the mandibles, extreme base of the scape of the antennæ, the region of the ocelli, the central portion of the mesonotum (except two parallel yellow lines), and a line on the tibiæ, black; pubescence and pollen-brush white; wings hyaline, tegulæ yellow, with a red spot in the centre, nervures black.

♂. Similar; subapical segment with two, and apical segment with four teeth: a line on all the femora, and the whole of the posterior trochanters, black.

Hab. Deesa.

Length 8-9 mm.; Exp. 16-18 mm.

16. *ANTHIDIUM VIATICUM*, n. sp.

♀. Head, thorax and abdomen closely and finely, the sides of the clypeus and the face below the base of the antennæ more sparsely and shallowly punctured; clypeus hexagonal, the anterior margin transverse and dentate, eyes slightly convergent below. Black; two spots near the apical angles of the clypeus, the sides of the face below the base of the antennæ, an elongate spot on each side of the face behind the eyes, a similar spot on the basal margin of the mesonotum, the margins of the scutellum, four irregularly-quadrate spots on abdominal segments 1-4 and two similar spots on abdominal segments five and six, yellow; legs variegated black and yellow; pubescence sparse, greyish white, pollen-brush white with a fuscous tinge; wings subfuscous, tegulæ very large, testaceous-red with dull yellow margins, nervures black.

♂. Similar, larger; clypeus, entirely pale yellow, with shallow punctures, its apical margin non-dentate, the four quadrate spots on abdominal segments 1-5, sixth segment with a single coronet-shaped spot; apical abdominal segment with five teeth.

Hab. Matheran.

Length ♀ 7-8 mm., ♂ 9 mm.; Exp. ♀ 14-15 mm., ♂ 18 mm.

17. *CERATINA CERE*a, n. sp.

♀ ♂. Smooth and impunctate; eyes slightly emarginate, distinctly converging below, median segment somewhat long, anterior portion almost flat, apical portion steeply sloped; abdomen longer than the head and thorax united, basal segment constricted. Black: the clypeus, scape of the antennæ in front, the sides of the pronotum, two elongate spots on second and third abdominal segments, the whole of the tarsi and the greater part of the tibiæ of all the legs, bright yellow; antennæ reddish-brown; wings clear hyaline, tegulæ yellow, nervures very pale testaceous, except the postcostal nervure and that enclosing the radial cell, which are dark-brown.

Hab. Deesa.

Length 5-6 mm.; Exp. 10-11 mm.

18. *CERATINA MUSCATELLA*, n. sp.

♀ ♂. Smooth and shining, a few scattered punctures on the posterior margins of the head and on the mesonotum, third and following

abdominal segments finely and closely punctured; an impressed line along the centre of the mesonotum, median segment rounded posteriorly, steeply sloped, the enclosed space at its base very convex, and having a medial longitudinal carina. Black; a spot on the clypeus, a broad line from near the base of the antennæ along the inner orbit of each eye, a narrow line on the cheeks, an interrupted line on the pronotum, a spot below the tegulæ, two contiguous spots on the scutellum, and a spot at the base of the posterior tibiæ, pale yellow; the abdomen in some specimens more or less red; wings hyaline, tegulæ dark brown, nervures black.

Hab. Simla.

Length 7-8 mm.; Exp. 12-14 mm.

19. *CERATINA LOQUATA*, n. sp.

♀ ♂. Smooth and shining, the third and following abdominal segments and the enclosed convex space at the base of the median segment, minutely punctured; the abdomen increases in width towards the apex. Black; a \perp -shaped mark on the clypeus, a short line on each side of it, not quite touching the inner orbits of the eyes, a spot on the labrum, an interrupted line on the pronotum (absent in some specimens), a spot below the tegulæ, two small spots on the scutellum (often obsolete), a line on the tibiæ of the anterior legs, and a spot at the base of the tibiæ of the posterior legs, pale yellow, often with a reddish tinge; wings hyaline, sometimes with a slightly fuscous tinge, tegulæ reddish-brown, nervures black.

Hab. Simla.

Length 6-7 mm.; Exp. 12-13 mm.

20. *CÆLIOXYST TAURUS*, n. sp.

♀. Head and thorax strongly and closely, abdomen more minutely punctured, the punctures on the fourth and fifth abdominal segments being extremely fine and shallow, the sixth segment impunctate; clypeus broader than long, a conspicuous longitudinal carina on the mesonotum, teeth of the scutellum moderately long and acute, scutellum rounded posteriorly; abdomen with segments 2-4 depressed in the middle apical abdominal segment long, acutely pointed, with a medial carina, the ventral plate slightly longer than the dorsal. Black; the flagellum of the antennæ, the legs, apical abdominal segment above, and the whole of the abdomen below, dark red; Pubescence snow white, dense on the clypeus and front, on the cheeks, thorax and median segment below, forming bands on abdominal segments 1-5 above, these bands much widened laterally and below; on the inside of the posterior tibiæ and tarsi the pubescence is golden; wings hyaline, with a slight fuscous

tinge at apex, sometimes the whole wings have a fuscous tinge; tegulæ black, with a dark red spot in the centre; nervures black.

♂. Similar, the whole of the abdomen punctured; the apical segment with eight teeth, two lateral, four apical above, and two below; the abdomen below, except the apical segment, is black, not red.

Hab. Deesa.

Length ♀ 8-11 mm., ♂ 7-9 mm.; Exp. ♀ 14-18 mm., ♂ 12-14 mm.

VIII.—*Studies in the Chemistry and Physiology of the Tea Leaf. Part I.*
The Enzymes of the Tea Leaf.—By HAROLD H. MANN, B.Sc.

[Received November 27th; Read December 4th, 1901.]

The production of a food product from the leaves of plants is in actual practice of very rare occurrence. Except in the case of a few vegetables and potherbs, and of some leaves used only as narcotics and stimulants, it may be said not to exist except in the case of tea. And in the production of tea, if the type of leaf used, the method of collection, the induction by artificial means of a constant unnatural succession of young growing shoots be taken into consideration, the whole question becomes of so exceptional a character that a study of the chemical and physiological condition prevailing under such circumstances would probably be extremely interesting. If, in addition, such a study be combined with that of the changes which take place in the leaf after plucking until its conversion into black tea,—changes which result in profound alterations in the substances present and which altogether alter the commercial characteristics of these products, the matter becomes one of great economic importance. In the series of papers I hope to contribute to the Asiatic Society on this subject, and of which this is the first, I shall try, however, to very largely eliminate the direct economic interest, which will be reserved for another place and another occasion.

In order, however, to follow the subject it will be necessary to give a short account of the processes by which tea is produced. The tea leaf as used in this manufacture consists of the youngest leaf on the plant, and only the youngest two open leaves on each shoot together with the unopened leaf bud are now usually plucked. This necessitates, if a large amount of leaf is not to get too old for plucking, and hence to be wasted, that every bush should be gone over by an expert plucker about every seven days. Having obtained the leaf in this manner, it is allowed to wither—to lose its turgescence—by exposure in very thin layers to air as cool as possible until the whole has got to such a condition that on rubbing in the hand the leaves no

longer break, but are sufficiently pliable to roll up. At this stage it is rolled, a process whose effect is to break the cells of the leaf, allow the sap to spread itself over the surface, and so come in contact with air during the process of fermentation. This latter merely consists in exposing, for a time varying from two to six hours, the rolled leaf in thin layers in as cool and airy a room as possible. Marked changes here take place; the green leaf takes on a brown coppery colour and acquires an aroma totally different from that of fresh leaf. When sufficiently fermented,—which is judged at present entirely by appearance and smell,—the whole mass of tea is dried usually by a powerful current of hot air, sorted and put on the market.

It is evident that the changes important from our point of view principally takes place during withering and fermentation. Withering has usually been considered to be little else than a process of partial drying without the loss of pliability which would take place were the operation conducted at a high temperature, and the idea that profound chemical changes may take place has hardly been mooted. On the other hand, the speculations as to the nature and cause of the fermentation process have been legion. In the early days it was usually considered to be merely incipient putrefaction, and this idea was supported by the fact that a slightly longer exposure than that given leads to an intensification of the brown colour, to the development of increased acidity and ultimately to putrefactive decomposition.

Prior to the experiments of Mr. Bamber,* the statements made rested on no experimental basis. His work however has revolutionised the ideas on the subject. He maintained (1) that very few organisms were present, and the time was too limited for their development in quantity, and that hence the process could not be caused by bacteria, (2) that the fermentation will not take place in absence of oxygen, even if the oxygen was replaced by carbon dioxide, (3) that a large quantity of air is required, (4) that after heating the leaf with dry steam for a few minutes the fermentation proceeded normally. Hence he maintained that the so-called fermentation process was not a fermentation at all, but was due merely to the direct chemical action of the atmospheric oxygen on the constituents of the juice exposed in thin layers, and he hence substituted the term "oxidation" for "fermentation" in naming the process.

In this position the question remained, except for mere speculative opinions,† until the beginning of 1900, when Mr. Bamber returned to the question, and to a certain extent revised his former opinion. He

* Chemistry and Agriculture of Tea, 1893.

† See, for instance, D. Crole, Journal of the Society of Arts.

then wrote as follows: * "Quite recently I have succeeded after numerous attempts in isolating a minute proportion of a soluble oxidising ferment somewhat similar to the oxidases recently discovered in several plants of different natural orders. The substance in question, which evidently has a considerable bearing on the oxidising properties of the tea, apparently does not exist in the active form in the fresh green leaf, but is changed either during the withering if the leaf is bruised, or during the rolling processes when the various organic acids, etc., are liberated from the cells." This was, I believe, the first announcement of the discovery of a soluble ferment or oxidase in the tea leaf, and of course it meant that Mr. Bamber no longer attributed the changes which take place entirely to the oxidising action of the air independently of ferments of any kind.

Later in 1900 in a private communication to me, Mr. C. R. Newton of Kurseong stated that he had detected an oxidase in the leaf, but the observation was never published till a few weeks ago.† In the meantime Mr. Aso, a Japanese scientist, has published his discovery of the same ferment, but as I have not been able to get hold of the publication in which he announces his work,‡ I am unable to say to what extent he has carried his researches.

My own work was done by the courtesy of Messrs. Finlay, Muir & Co., the Agents, the Amalgamated Tea Estate Company, Ltd., the Owners, and Mr. J. D. Gwilt, the Manager of the Moondakotee Tea Estate, Darjeeling, on that estate, during the past tea-making season.

In trying to ascertain the nature of the changes which occur during the manufacture of tea leaf, it seemed of primary importance to determine to what extent, if any, bacterial action intervened, especially as Mr. Bamber's experiments were not quite convincing on the subject. For this purpose it was necessary to cultivate any organisms which might be present on a medium which would as far as possible eliminate the ordinary putrefactive bacteria and only allow those which could have any effect on the tea leaf to grow. This at once puts out of court such common media as peptogelatin, peptone-agar-agar, or any similar preparations as the basis of cultivation in which, as a matter of fact, a large number of putrefactive organisms (many of them of the *Bacillus subtilis* type) do actually grow when fermenting tea is placed in contact with them. The medium finally adopted consisted of tea leaf itself ground up finely, and then placed in small patches 1 to 1½ inches in

* Report on Ceylon Tea Soils. Colombo, 1900.

† Indian Gardening and Planting. November 7th, 1901.

‡ Bulletin of the Imperial College of Agriculture, Tokio. 1901. Vol. 4, page 254.

diameter inside a petri dish, and sterilised. A slight change of colour took place during sterilisation, but afterwards none, and dishes so prepared could be kept for weeks. The sterilised tea leaf thus obtained was then inoculated with fermenting leaf, and in about two days colonies were evidently appearing. After three days' culture, these were examined and inoculated with sterilised tea juice, and after a further three days' growth there, the cultures of the second generation were utilised. In every case only one organism was certainly found. It produced colonies consisting of yellowish brown slimy masses without shape, and raised up like drops from the mass of the sterilised tea leaf. In texture these colonies were sticky and a little ropy. Under the microscope the organism was found to be a small bacillus about $1\frac{1}{2} \mu$ long and nearly 1μ broad. A pure culture having been obtained sterilised leaf was inoculated with a solution containing the organism in large amounts. No change whatever took place in colour in three hours,—the normal time of fermentation,—but a sour smell had developed. If freshly rolled leaf, instead of sterilised leaf, were used, the inoculated portion had taken on a sour smell in $1\frac{1}{2}$ hours, while the check experiment was equally coloured, but the fermentation was proceeding normally. The organism was evidently in fact one of the many lactic acid bacteria and had no part whatever in the normal process of fermentation. Inasmuch as this was the only microbe which could be isolated in this way, as it had no effect on the colouring of the tea leaf, and as it caused the leaf to become sour earlier than it would otherwise have done, one may, I think, take it as finally settled that microbial organisms play no essential part in the fermentation of tea, and that when present they are rather of the nature of impurities than essential factors in the process.

In the absence of bacteria capable of causing the changes observed during the fermentation of tea, it was natural to look for enzyme action, especially as during the past five years the effect of unorganised ferments has been discovered to be paramount in cases where their influence had hardly been previously suspected. The curing and fermentation of tobacco is an example. Here Oscar Loew* has shown that the changes taking place during both these processes are primarily due to the action of enzymes. But in attempting to isolate the active ferments in tea, one is met at the outset by a difficulty pointed out long ago by Brown and Morris† that it was very difficult to extract enzymes from vegetable tissues in presence of a solution containing tannin. Since the young tea leaf contains twenty per cent. of tannin

* Reports of the U.S.A. Department Agriculture. Nos. 59, 60 and 65, 1899-1901.

† Journal of the Chemical Society. 1893.

(calculated on the dry matter) the difficulty was especially great in the present case. The method finally adopted for isolating and at a latter date for estimating the amount of oxidising enzyme present was as follows:—10 grams of fresh (or 6-6 grams of withered leaf) were ground up in a mortar till they formed a pulp, and in each case 5 grams of hide powder (pure for analysis) were added and the mass again ground thoroughly together. 50 cubic centimeters of water were now thoroughly incorporated with the mixture and the whole left for two hours. At the end of this time the mass was filtered quickly through cloth, with pressure, and the residue washed twice with water. It was found that practically the whole of the extractable part of the oxidising enzyme was thus removed. The liquid obtained was now mixed with four times its volume of alcohol, which precipitated the whole of the enzyme. After settling thoroughly, the precipitate was filtered again through cloth, and to the residue 25 to 30 c. c. of water were added. The whole of the enzyme was thus obtained in a small volume which on filtration gave a clear liquid in which various tests could be made.

The standard test for oxidising enzymes or oxidases is that with guaiacum resin. If an alcoholic solution of this resin be mixed with a liquid containing one of the class of substances under discussion, a blue colour varying in intensity with the quantity of enzymes present will appear after two or three minutes. With the solution from tea leaf prepared as above, this reaction was obtained immediately, and if further a drop or two of Hydrogen Peroxide were added the reaction became very much more intense. It was hence at first supposed that two enzymes were present, the one giving a blue colour without Hydrogen Peroxide, the other only producing the reaction in its presence. If this were the case they ought surely to have different resistances to heat, and by this means one ought to be able to separate them. This was found, however, not to be the case. A solution in water containing the oxidases was exposed to various temperatures in each case for three minutes, with the following results:—

TEMPERATURE.	REACTION WITH GUAIACUM RESIN.	
	Without Hydrogen Peroxide.	With Hydrogen Peroxide.
60°C.	Just as intense as before heating.	Just as intense as before heating.
70°C.	Do.	Do.
80-81°C.	Slight decrease in intensity of reaction.	Reaction distinctly lower in intensity.
83-85°C.	Reaction practically disappeared.	Reaction almost disappeared.

There is therefore no difference in the sensitiveness of the substances producing the two reactions to heat, and both are destroyed by an exposure for three minutes in aqueous solution to 83 to 85° C. and the destruction commences below 80° C. One may therefore say,—and the conclusion is confirmed by the result of a large number of other attempts (to be afterwards referred to) to isolate the two apparently different enzymes,—that we have no evidence of the presence of more than one ferment oxidising guaiacum in the tea juice. I am inclined to attribute the difference in reaction to the presence of part of the ferment in the juice as zymogen or pro-enzyme, which is brought into definite action by the Hydrogen Peroxide. The distinction between the reactions with and without Hydrogen Peroxide, therefore, remains a convenient one, and I have kept it up throughout the present work.

To estimate the amount of these enzymes 5 c.c. of the clear liquid prepared as above, were mixed with an equal volume of alcohol, and then 10 drops of a solution of guaiacum resin in alcohol added, and the colour measured in a Lovibond's tintometer. The measurement must always be made at the same length of time after the addition of guaiacum tincture. After the intensity of the colour has been noted, .5 c.c. of a 10 volume solution of Hydrogen Peroxide were added and the colour again measured. The intensity of colour gives a rough measure of the relative amount of enzyme in the several cases, and has been utilised for this purpose throughout the present work. It depends on the fact that the colour given is all but absolutely a pure blue, and hence one can neglect the amount of any other colour which may be present in the liquid, and merely take the intensity of the blue as showing the relative amount of the oxidase.

It seems almost impossible to prepare the enzyme pure in a dried condition. If the clear solution prepared as above be reprecipitated with alcohol, a mass is produced very active towards guaiacum solution, etc., but if an attempt is made to dry the precipitate at a low temperature its oxidising power rapidly diminishes, and when dry there is hardly any reaction left. The whole of the reactions had therefore to be studied in the solution prepared as above, which in addition to the enzyme contained a certain proportion of gummy, pectic and saline matters.

The oxidase was very sensitive to the action of acids. A solution of the enzyme was immediately rendered absolutely ineffective in a solution containing .4 per cent. of Sulphuric Acid. .04 per cent. had, however, only very slight effect after 2 hours. 3 per cent. of Acetic Acid destroyed the ferment entirely in 2 hours. By Alkalies it was less affected but still was rapidly destroyed. 3 per cent. Ammonia nearly destroyed all action after $4\frac{1}{2}$ hours. Caustic Potash of the same strength had little

effect after 2 hours, but after 4 hours only a slight reaction was obtained until Hydrogen Peroxide was added, when a fairly intense blue colour was produced with guaiacum tincture. After 18 hours there was still the difference, though even with Peroxide the colour was much less intense. This is a strong indication that the latter reagent liberates the enzyme from a compound (a pro-enzyme) in which it was much less easily attacked by Alkalies than when already free.

That we have here to deal with an oxidising enzyme was made clear by its action with hydroquinone and with pyrogallol. In the former case darkening, indicating oxidation, was very rapid in presence of the enzyme, and much more so than in check solutions to which either no addition was made, or to which even a boiled solution of the ferment had been added. I was not able to isolate the product of oxidation. The same rapid darkening took place in presence of the enzyme with pyrogallol. In three hours the colour had become very dark brown, while both the duplicates were hardly tinted brown. After 18 hours the difference was extreme, the pyrogallol being almost entirely oxidised in the one case, only a light brown colour having been produced with boiled ferment or with none at all. Gallotannic Acid behaved differently and showed itself far more resistant to oxidation than either of the above substances, very slight change having taken place even after 18 hours.

The reaction with Hydroquinone was so striking that it was used to determine the optimum temperature for the activity of the enzyme. Three solutions of Hydroquinone were prepared. No. 1 was kept at ordinary temperature (26° C.) No. 2 at 50-55° C. No. 3 at 60-62° C. After 1½ hours No. 1 was hardly changed, while oxidation was proceeding rapidly in Nos. 2 and 3 and no difference could be detected between them. After 4 hours however while No. 1 still showed hardly any alteration, No. 2 was far and away ahead of No. 3 in the progress of the reaction. It was regrettable that there seemed no means of measuring exactly this progress, but the experiment clearly shows that the best temperature for the action of the ferment does not exceed 53° C. and that it is much more rapid at this temperature than at the usual temperature at which the operation is carried out.

The crucial test, however, as to the relation of this oxidase to the fermentation of tea was whether when a solution of the enzyme was added to tea juice, the colour which forms the mark of fermented tea was produced more quickly than in a normal case. An experiment on this line was therefore made, and the colour was produced considerably more quickly than in the untreated juice. An attempt was made to utilise sterilised tea juice for this purpose, but the process of sterilising to destroy the enzyme (as the ferment cannot be removed by any filtra-

tion method) induced such profound changes in the tea juice that it was impossible to make the absolute test which this method would have given. When a more rapid colouring of tea juice or tea leaf takes place in presence of an additional quantity of the enzyme, and at the same time proceeds normally, there seems no justification for doubting the essential connection of the oxidase isolated from tea leaf with fermentprocess.

The next point would naturally be to ascertain the part of the leaf richest in enzyme, and the leaf of the flushing shoot plucked for manufacture which contained the most. This was therefore determined by carefully separating the leaves from one another and from the stalk, and determining the oxidase in each separately by the method previously described. The following results were obtained, the amount present in the tip leaf being unity in each case, and the whole being calculated on the dry matter of the leaf.

	Relative amount of active enzyme.	Relative total amount of enzyme.
Tip unopened leaf ...	1.00	1.00
First open leaf ...	.65	.61
Second open leaf ...	.48	.80 (?)
Leaf stalk ...	1.64	1.39

This indicates a rapid decrease in the amount of enzyme present as the leaf becomes older, but that the stalk contains a good deal more than any other part of the shoot. The above figures much exaggerate this excess, however, owing to the fact that the stalk contains much more water than the leaf, and as a matter of fact in the fresh condition the tip leaf and the stalk contain about an equal amount of enzyme. It is interesting to compare the relation of various other constituents of the leaves to the enzyme as given above, and for the Acidity, the Tannin, and Phosphoric Acid, we have these as follows:—

	Total Acidity.	Acidity in the absence of Tannin.	Tannin.	Phosphoric Acid.
Tip leaf ...	1.00	1.00	1.00	1.00
First open leaf ...	.94	1.09	1.03	.88
Second open leaf ...	.94	1.06	.91	.75
Leaf stalk ...	.70	1.09	.86	.79

In each case the tip leaf is regarded as unity, and each is calculated on the dry matter. The acidity due to the tannin in each case amounted to about half the total acidity, using phenol phthalein as indicator, and appeared to be practically identical (on the dry matter) throughout the flushing shoot. The enzyme therefore appears not to bear any very close relationship to any of these constituents calculated as above, if the stalk be included, but if this be left out (as I think it may be, for it is to a great extent nothing but a channel of conveyance), then the enzyme will be found to follow both the Tannin and the Phosphoric Acid, but not the acidity, except that caused by the tannic acid.

The practical consideration now comes in as to the relation of this enzyme to quality in tea. The only means of ascertaining this was to compare the leaf from gardens lying near one another producing distinctly different types of tea, and teas which were regarded by experts as of different quality. It is necessary, of course, in face of the distribution of the enzyme in the flushing shoot above pointed out, that the leaf shall be of approximately the same type. For instance, a stalky tea leaf could not in any sort of fashion be compared with one giving little stalk. With this reservation, which was taken into account in the experiments which follow, the figures obtained seem to indicate that a large amount of ferment means a high quality tea, and a reduction in the enzyme present means a lowering of the flavour of the product. It is in the flavour that the effect is most marked, the strength of the tea being not nearly so much affected.

Three gardens are concerned in what follows. These are A, which, judged by market prices, has been making a medium Darjeeling tea; B, which has had the reputation of making about the best tea in the Darjeeling district for many years, and C, which has produced absolutely the highest value teas in the district during the past season.

A comparison was first made between a sample of leaf from A and two samples from bushes of different types from C, No 1 being an "Assam" type of plant, and No. 2 from a "China" type. The following figures were obtained :—

	Relative amount of active enzyme.	Relative total amount of enzyme.
A.	1.00	1.00
C. No. 1. ...	2.17	2.18
C. No. 2. ...	1.44	1.68

The amount of oxidase in A is here regarded as unity, and its type of plant was "China", and all figures are given on the dry matter of the leaf as plucked for manufacture. In each case a much larger amount of enzyme was present in the leaf which made the better tea.

From Garden B, I had three samples of leaf. No. 1 was from young "Assam" plant producing excellent tea, No. 2 was from a low level extension also of "Assam" plant but giving the worst tea in the garden though still quite as good as the district average, No. 3 was from "China" plant producing tea of very high quality. Comparing, in precisely the same manner as above, all these samples of leaf with that from garden A the following figures were obtained :—

	Relative amount of active enzyme.	Relative amount of active enzyme.
A.	1.00	1.00
B. No. 1 ...	1.88	1.03
B. No. 2 ...	1.17	1.32
B. No. 3 ...	1.83	1.32

In this case again it appears that the quality varies with the quantity of ferment present in the leaf in an active form. It will be noticed that the various amounts of enzyme are much closer together when the total, including the supposed pro-enzyme, is considered, than when the active form only is taken into consideration. It may well be that this difference is a real one, and that there is some cause in certain places from soil, climate or other consideration which may prevent the formation of active enzyme, and such a cause would affect the quality.

Another point remains in this connection. What effect has withering on the amount of ferment? The answer to this question has been exceedingly interesting, and seems to indicate that this operation possesses a function in the manufacture hitherto quite unsuspected, and which leads to a very different conception of the process to that hitherto held. The leaf from gardens A and B above considered, were allowed to wither, and taking full account of the corresponding loss of moisture, the enzyme again determined. Taking the oxidase in the fresh leaf at garden A as unity (that is to say that the unit in the last table is the same as unit in the following) we have :—

	Relative amount of active enzyme.	Percentage increase during withering.	Relative total amount of enzyme.	Percentage increase during withering.
A.	1.81	81.0	1.69	69.0
B No. 1 ...	2.49	31.9	1.87	43.8
B. Na. 2 ...	1.88	60.7	1.87	41.6
B. No. 3 ...	2.19	19.7	2.19	65.9

There remains to be considered the circumstances which cause the production of the oxidising enzyme by the plant. I have as yet only had the opportunity to touch upon one or two of these. It seemed probable however that the amount of light received by the plant would very materially influence the amount. Three bushes, side by side, were therefore taken, and one was so covered up for ten days, so that the leaf grew in darkness not quite sufficient to etiolate the young leaves. Leaf was plucked from all three bushes on the same day, in No. 1 as soon as it was light in the morning, in No. 2 (the darkened plant) soon afterwards, and in No. 3 late in the afternoon.

From the result it would appear that darkness favours the formation of the oxidase, and that there is a difference in this respect between the leaf gathered in the early morning and that obtained after a day's sunshine. In the leaf grown entirely in darkness the reserve stock or pro-enzyme seemed to have been increased, but that immediately active was rather lower than in the normally produced leaf. I intend to take up this line of investigation more thoroughly later on.

In a recent publication I have shown how dependent the quality of tea is on the amount of Phosphoric Acid in the soil. It is curious to find that this connection of flavour and Phosphoric Acid, according to the present experiments, seems to run parallel with the apparent connection between Phosphoric Acid in the soil (and also in the leaf,) and the amount of oxidising enzyme.

I give here the analyses of soil from the gardens A and C above mentioned, and it will be at once seen that the amount of Phosphoric Acid corresponds closely with the amount of enzyme in the leaf. I am disposed to insist on this point in view of the previously indicated relationship of quality, *i.e.*, flavour, to Phosphoric Acid in the soil.

A.

C.

Phosphoric Acid '061 '124

The only question remaining to be discussed with relation to the oxidase under consideration appears to be its localisation in the leaf and stalk. An attempt was made to determine its position by three methods. The first of these consisted in cutting the sections of leaf and stalk and ascertaining in what cells the brown colour commenced to form. In the leaf this always took place at definite points in the centre of the leaf. In the cells where the browning commenced there seemed to be on examination with a very high power in many cases a small irregular black body from which the browning radiated. This could only be seen where the sections are thin and consisted of little

more than one layer of cells. I have not been able yet to more exactly ascertain the nature of these small black bodies. The second means of ascertaining the whereabouts of the enzyme was to kill the leaf in chloroform vapour, when it became brown in a very few minutes, and then cut sections of the leaf and leaf stalk as before. In the leaf precisely the same occurred as was found by the first method,—the brown colouration always commenced at points in the centre of the tissue. In the stalk the result was very definite. Oxidation always occurred first just outside the fibro-vascular bundles, then it took place just inside the same layer, and thirdly the cells just inside the epidermis were attacked. A third method gave results quite agreeing with this as to the stalk, but no definite results were obtained with the leaf. In examining the sections by this method, they were first left 12 hours in alcohol to extract the tannin and precipitate the enzyme. They were then put in a drop of water on a slide, a drop of guaiacum tincture immediately added and the preparation then again washed with water. The blue compound is soluble in alcohol, and the enzyme is soluble in water so that it is necessary to do these operations as rapidly as possible.

The result obtained showed a general blueing of the section, but on leaving a short time in glycerine the parts to which the enzyme had merely spread faded, and left the rest quite heavily stained. The fibro-vascular bundles were quite free from blue colour, and as for the rest it was most intense first in the cells just outside this layer, second in the point just inside it, and third just inside the epidermis. So far as the stalk is concerned then, the several methods agree as to the points at which the greatest amount of enzyme is to be found, and this distribution is almost exactly the same as that of the largest quantity of the tannic acid.

In general, therefore, with regard to the question already considered it has been established—

(1) That an oxidase occurs in the leaf of the tea-plant used for manufacturing tea.

(2) That this oxidase is the principal agent in bringing about the fermentation and colouring of the leaf. It is most active below 55°C. and is destroyed about 80°C., is very sensitive to acids, and also to alkalis, but not to quite the same extent. There is distinct evidence that part of it usually occurs as a pro-enzyme in the leaf.

(3) That it occurs in greatest quantity in the unopened tip leaf of the shoot, and that the quantity decreases as the leaves get older, but that the stalk contains at least the same amount as the tip leaf.

(4) That leaf, taking into consideration gardens of the same type, which contains the most enzyme makes the most highly flavoured tea.

This increase of enzyme in the leaf seems connected in some way with the amount of phosphates in the soil.

(5) That the amount of enzyme in the leaf materially increases during withering, a fact which throws an entirely new light on the nature of the process, and makes it probable that it performs much more important functions in the manufacture than those with which it has been hitherto credited.

Other enzymes occur in the tea leaf, but I have no evidence at present that their part in the manufacture of tea is of great importance. Starch occurs in very minute proportion, and as would be expected, a small quantity of diastase with it. This starch persists throughout the withering operation but entirely disappears during the fermentation. The diastase can however be detected right through until the tea is fixed, but only in very small amount. The tests I made as to the existence of a proteolytic enzyme leave the matter in some doubt, but I certainly could get no reaction by Fermi and Buscaglioni's method with gelatine.

The Catalase of Oscar Loew * was, of course, present in rather large quantity, but I can attribute no important function in the manufacture of tea to its presence. Considering the tendency existing to form Hydrogen Peroxide in organic liquids exposed to sunlight, it seems natural to consider that it is here present to prevent the formation of this substance, which could only be a source of injury during the growth of the tea to the plant. Its presence almost exclusively immediately under the cuticle cells would materially support this hypothesis.

In conclusion, I have to thank two or three gentlemen whose assistance has been of material advantage to me in this work: These are Mr. Hooper of the Indian Museum, Calcutta, for making several analyses of materials for me, and to Mr. C. R. Newton of Kurseong, whose help in the microscopic part of the work was extremely valuable.

* See Report U.S.A. Dept. Agri., No. 65, 1900.

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JOURNAL

OF THE

ASIATIC SOCIETY OF BENGAL.

PART II.

TITLE PAGE AND INDEX

FOR

1901.

ON THE PUBLICATIONS

OF THE

ASIATIC SOCIETY.

The *Proceedings* of the Asiatic Society are issued ten times a year as soon as possible after the General Meetings which are held on the first Wednesday in every month in the year except September and October; they contain an account of the meeting with some of the shorter and less important papers read at it, while only titles or short resumés of the longer papers, which are subsequently published in the *Journal*, are given.

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NOTE ON THE PUBLICATIONS

OF THE

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The *Proceedings* of the Asiatic Society are issued ten times a year as soon as possible after the General Meetings which are held on the first Wednesday in every month in the year except September and October ; they contain an account of the meeting with some of the shorter and less important papers read at it, while only titles or short resumé of the longer papers, which are subsequently published in the *Journal*, are given.

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